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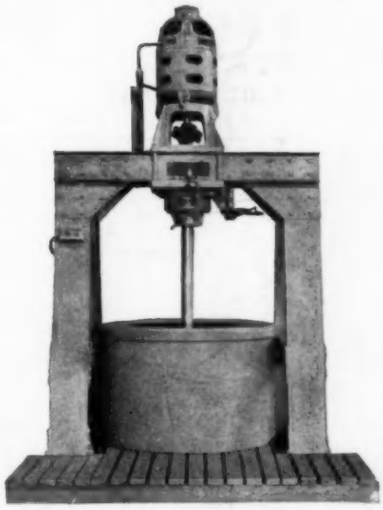

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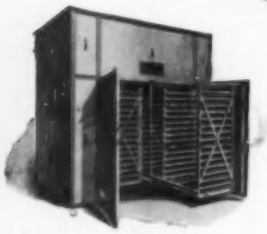

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE
Editor

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By Vote of The People

WITH the lesser controversies of partisan politics *Chem. & Met.* has no concern, but we cannot refrain from brief comment on the broader aspects of the recent election in which the people spoke in no uncertain manner. In the first place, the election of Coolidge and Dawes was so decisive that one wonders now how even a minor prophet could have suggested the possibility of a deadlock that would throw upon Congress the responsibility of electing a President. Second in importance was the overwhelming defeat of LaFollette and the repudiation of his policies, particularly his advocacy of government ownership of railroads. The third party leader campaigned on a platform so unequivocal in its attitude on this subject, as well as on the authority of the Supreme Court, that he must have rallied large numbers to his support if there were anything like widespread acceptance of his views. It is more than evident that the great mass of the people will have no truck with those who advocate such policies. Mr. Hoover's views on government ownership are more acceptable than those of LaFollette.

Two other straws show the drift of public opinion away from government ownership. In California the people defeated a bill authorizing the state to buy and build hydro-electric generating and transmission systems, while in the State of Washington they likewise defeated a bill permitting cities and towns to buy and sell electric current and to acquire and construct generating and distribution systems. It should be a hopeful sign for industry in this country that the people still put their faith in private initiative and individual incentive which have been responsible for the marvelous industrial development of the United States. Still more gratifying is the evidence that they will not be stampeded or swept off their feet by plausible venders of economic nostrums.

Income Taxes and Tax-Exempt Securities

WHATEVER gratification the American people have obtained from the recent promiscuous publication of income tax payments, thoughtful readers must have been impressed by one fact—namely, that many persons known to have large incomes pay comparatively insignificant taxes. Nor is this to be construed as evidence of false reports on the part of taxpayers or a deliberate concealment of sources of revenue. The fact probably is that we have here tangible evidence of a practice against which economists and federal authorities have long complained—heavy and widespread investment in tax-exempt securities.

The dual evil of this condition has repeatedly been emphasized in the business press: not only do large incomes escape taxation but industrial expansion is hampered by the difficulty of obtaining funds. During the debates on taxation in Congress when the present revenue law was framed, advocates of a Constitutional amendment prohibiting the issue of tax-exempt securities showed clearly how unattractive were ordinary taxable industrial securities in comparison with those exempt from taxation. An attempt was then made to have Congress pass a resolution favoring a suitable Constitutional amendment to correct a condition known to be economically unsound, but the result was negative.

If the present orgy of publication of income taxes will serve once more to focus attention on the evil of tax-exempt securities, perhaps this new invasion of individual privacy will be tolerated for the good it can do. Otherwise it will merely continue to excite the curiosity of some and arouse the anger of others. The great lesson to be learned is the importance of initiating and supporting all legitimate steps to abolish tax-exempt securities, thereby insuring a fair individual burden of taxation and putting industry on an equal footing with states and municipalities in competing for money available for investment.

The Importance of The Cracking Process

ONE whose name carries authority in the petroleum industry has recently characterized the successful large-scale cracking of heavy oils to produce gasoline as the outstanding chemical engineering achievement of this generation. And yet only a few months ago the government, in launching a suit against half a hundred leading oil companies, declared in effect that there are no valid patents on cracking processes; that the patents over which the industry has had its disputes are in reality unimportant frills—smoke screens for restricting production and boosting prices. To attempt to reconcile these views here is futile; the legal and technical questions involved are soon to occupy the minds of great jurists and patent lawyers and the leaders of the chemical and engineering professions. The point we would make is that, outside of the oil industry itself, there is not an adequate appreciation of the great benefit which the general public has derived from the development of the cracking process.

It will be one of the purposes of an unusual series of articles, begun in this issue, to acquaint *Chem. & Met.* readers with the true significance of this development. Dr. Brownlee tells us, in a very interesting and readable way, how the cracking process has changed from a laboratory curiosity in 1912 to the most important factor in the present-day refinery. Except for the cracking process the country already would have suffered from a serious shortage of gasoline. It is only because it has been possible to increase the average

yield per barrel of crude oil from 18.6 per cent in 1914 to more than 31 per cent in 1923 that we have been able to meet our greatly enlarged requirements for motor fuel.

This amazing advance has been more of an engineering, rather than a purely chemical, achievement. The theory of cracking is comparatively simple, but its successful application on a large scale has brought with it many problems of construction and operation. In the past few years approximately 2,500 cracking units have been built, capable of treating more than 200,000,000 bbl. of heavy oil annually, to yield, perhaps, two and a half billion gallons of gasoline per year. Such is the tremendous scale of operations for which a great industry is dependent upon the cracking process. It is a striking testimony to technology—to the application of chemical engineering knowledge and equipment. More important, it is a definite economic service to the general public in the production of an essential commodity with the minimum waste of an irreplaceable resource.

Shoe Manufacture, Salesmanship And Leather Consumption

THE slump in leather sales seems to have been traced to a serious decline in the sale of shoes in recent times, the reason for which is forming the basis of many conjectures. A study of this problem may not seem within our province; but we realize that it is the technical man—the research worker and the chemist—who is usually made to feel the first effect of adverse times; and in his interests we venture to suggest an investigation of one reason for the present slump: A growing lack of sympathy on the part of the retailer toward his customer. The only apparent means of escaping from the inane and unscientific chatter of the average clerk in a shoe store is to purchase something and depart. The result is that many persons continue to get service from footwear far beyond its allotted span of life. Those who can afford to patronize stores where exorbitant prices are asked and where especial effort is made to retain the custom of the wealthy have made no change. Those who can buy regularly of the style, shape and size to which they have become accustomed are still consuming shoes at the customary rate. But the majority, represented by the citizen whose quest for the fitting is met with the response that what he is wearing cannot be duplicated, that the style has been changed, is the victim of an intensive sales effort to warp personal judgment. The trade seems to think that the owner of feet successfully tortured into a new shape must inevitably come back for more.

In one large city a citizen of average means and normal pedal extremities made a pilgrimage through several large shoe stores in the hope of obtaining a foot covering that would not involve temporary torture and permanent distortion. In each he was told that he needed longer shoes. After purchases that involved a complete waste of money and after a reception that varied from the indifferent to the insulting, he rebelled, whereupon a smaller size was brought out, of a normal shape, which fitted. The shoe was of poor quality leather, and sold for less than two-thirds the price the customer was willing to pay. Following such an experience, it is not to be wondered at that a slump has occurred in the sale of shoes. The average citizen prefers shabbiness to discomfort; he views with increasing distaste the necessity of a visit to the shoe store and an altercation with an assistant bubbling with superficial sales talk, who seldom or never expects to see a customer the second time.

We have poignant proof that the retailing methods in vogue are responsible in individual instances for a decline in the consumption of shoe leather. The trouble is deep seated, but the reasons are not far to seek. Hats are made to fit the head; gloves are made to fit the hands; clothes to fit the body; but by far the great majority of shoes manufactured at the present time bear no resemblance, even in outline, to the shape of the human foot. It is merely an example of poetic justice that the shoemaker and the retailer should begin to "feel the pinch."

Getting the Most Out of "Chem. & Met."

TELEPHONE inquiries and correspondence from those who seek information about articles in back issues indicate that *Chem. & Met.* is considered valuable as a book of reference as well as a chronicle of current technologic progress. Ordinary subscribers who have their copies bound at the end of each half year are doubtless in the minority, because of the cost. There is, however, an economical alternative to this, by which nearly all the advantages of binding may be realized, to the avoidance of disappointment or delay because of misplaced or lost issues when reference to back numbers is necessary. Doubtless many of our readers have put into effect some plan of home binding; but for the benefit of others we commend a simple system, which makes for efficiency, neatness and ready accessibility, used by Dr. F. E. Twining in his laboratory library at Fresno, Calif. The durability of his home-bound volumes is evidenced by the fact that some have been in service for 18 years and are still in good condition.

The advertising matter and staples are first removed. The pack of issues that constitutes the volume is then stacked in order, with the index forming the first page. Two pieces of 2-in. board are then taken, one 14x3 in. and the other 16x3 in. The shorter is placed underneath the volume, in line with and about ½ in. away from the binding edge, extending 1 in. at each end beyond the top and bottom edges. The second piece is then placed in the same position on top of the volume, to extend 1 in. at one end and 3 in. at the other. These binding boards are then firmly held in place by clamps or bolts. With the longer board toward the operator and its extension to the right, the pack is then placed so that the lower edge of the shorter board rests on the edge of a bench, the extension of the longer piece being held in a vise. The binding edge is then sawed to a depth of ¼ or ⅜ in., about five notches being made, spaced equidistant; the "backbone" is then well painted with white glue, which has been liquefied by heat. A piece of strong cord is then taken; and, starting at an end notch, this is laid in the notches, from one side to the other, until the last is reached; then passed back in the same way and tied to the starting end. Another coat of glue is added, to be covered with a strip of strong muslin. The glue must be allowed to set before the clamps are removed. A covering of stout brown paper or other suitable material may be used as a protection for the first and last pages of the volume.

The comparatively small amount of labor needed semi-annually to assemble twenty-six issues in con-

venient and accessible form will soon be forgotten in the advantages resulting. We believe that the suggestion only needs publicity to be widely adopted, as an alternative to the stacking of back issues of *Chem. & Met.* in unsightly and inconvenient piles, whereby occasional copies are lost and the tracing of an article is a difficult matter. If a sufficient number of our readers are interested in this plan, and will inform us of this at once, we shall be glad to arrange for the printing of a label on artificial leather as a "backbone" title for use as soon as each volume is completed.

Packing Goods For Export

ONE of our British contemporaries, *The Oil and Colour Trades Journal*, is rather amused at some of America's amateurish efforts as an exporter. Apparently the shoe fits the foot, however, for this time it is our own Consular Service that has been telling tales out of school. It seems that a Costa Rican drug importer wanted some ointment and he asked an American pharmaceutical house to ship him 10 kilograms in a wooden keg. But in this country we are finicky about putting our ointment in such things as wooden kegs and so when the order was filled it was shipped in a nice sanitary earthenware container weighing 19 kg.—whereas the pre-Volsteadian relic would have weighed but 1 kg. Unfortunately the customs duties down in Costa Rica are based on gross weight, and the importer was forced to pay a duty of $40.87 on $12 worth of ointment.

In another case a foreign firm wanted to buy a certain well-known brand of soap and for good and sufficient reasons wanted it unwrapped. But unwrapped soap in the United States takes us back to frontier days, and just to educate the pesky foreigner to our ways, the manufacturer proudly sent forth his product in its usual artistic wrapping. For the privilege of importing wrapped soap, the customer paid to the Custom House an additional duty of 50c. per kilogram.

The point is, and our British friends recognize it, that these are the sort of occurrences that turn business into the hands of more experienced rivals. Correct packaging of goods is among the first exercises in the Exporter's Primer, but apparently some of our industries were playing hooky the day that lesson was taught.

Flexibility in Gas Output Essential for Success

CHEMICALLY controlled industries are finding more and more advantage in city gas for small-scale and incidental industrial heating; and even the principal heating operations of many plants are now performed with city gas both because of the convenience and because of the efficiency that has been developed with modern methods and equipment. As a result the modern gas plant sells from 20 to 40 per cent of its gas for industrial purposes.

This industrial load varies, often from day to day, and is especially low on Saturdays and Sundays, when many of the industrial establishments close. The resulting large variation in gas send-out has necessitated development of manufacturing processes that can be speeded up or slowed down materially, not only from season to season but also from one day to the next.

Commonly the variation in supply thus required is accomplished by water-gas equipment that can be operated at widely varying loads from day to day without serious loss in efficiency. But naturally the gas man wishes to use bituminous coal as his raw material wherever possible. This means that he prefers a coal-gas rather than a water-gas process to be the backbone of his business. Coke-oven builders have undertaken to meet this need by devising a scheme for oven heating that will permit the gas-works manager at will to fire his ovens either with oven gas or with other gas made in a producer or blue water-gas machine. One of the first examples of such an installation was erected for the Battle Creek (Mich.) Gas Co. by The Koppers Co. The problem that was met and solved so successfully in that plant is described elsewhere in this issue by the first of a series of articles on the supply of city gas for industrial heating purposes.

It is believed that the user of city gas will find quite as much of interest and importance in this series as will the gas-works manager who is or shortly will be confronted with the problem of meeting large industrial gas demands that vary widely from day to day, without use of raw materials or processes involving unduly high unit cost for operation.

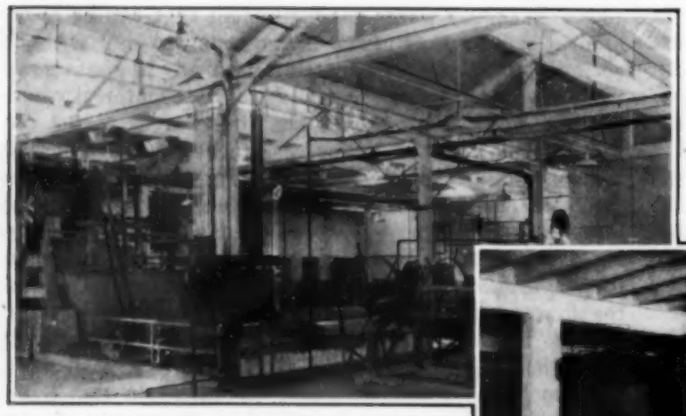
Recirculation System for Low-Temperature Heating

MANY low-temperature heating and drying operations, which on the surface appear very simple, have failed to receive the deserved technical consideration in industry. Their very ease of accomplishment has been the cause of inefficiency. For this reason excessive consumption of electrical current, gas, oil or coal is occurring in many plants.

These facts have been brought out recently in striking fashion by cases in which gas has replaced other fuel, a replacement that has been possible despite much greater cost per B.t.u., because of the care and skill given the furnace or drier designs. In other words, the improvement in efficiency has not been alone because of advantage in change from solid fuel to gas, which is, of course, a more easily controllable source of heat, but also because of better appliance design.

But even in these cases one of the best methods of getting high efficiency in low-temperature heating has often been neglected. Stepping down high-temperature products of combustion to the desired low temperatures is commonly done with an excess of air. This means waste of all the heat required to raise the surplus air from room temperature to the temperature of the escaping flue products. A much better way to accomplish the same transformation is to mix the correct proportion of flue products, recirculated from the furnace outlet, with the incoming hot products of combustion. Thus the maximum safe working temperature on the material to be processed is obtained without introducing any surplus air.

This system of recirculation of part of the flue products is essential for the highest efficiency in operating low-temperature equipment. It bears the same relation to such low-temperature work as recuperation and regeneration do to high-temperature processing. Often the use of a recirculation system means the difference between 30 per cent efficiency and 60 per cent efficiency in the heating operation. And fuel saving such as this is "not to be sneezed at" with present high cost of B.t.u.



(BELOW) Racks of green ware entering the Proctor & Schwartz tunnel drier with both temperature and humidity control. The atmosphere at the entrance end is maintained at a high relative humidity and fairly low temperature, the humidity decreasing uniformly toward the exit and the temperature increasing. Drying is completed in from 24 to 60 hours. At the exit of the drier, each insulator is closely inspected before being glazed.

(ABOVE) The body preparation department. Silica and feldspar are ground in this department and the ball clays are washed, graded, stored in suspension and filter pressed.

(LOWER RIGHT) Assembling suspension insulators with portland cement.

It Is Not Unusual to Find Chemical Engineering Equipment In Modern Ceramic Plants

(LEFT) In the Westinghouse factory the hot-pressing method is used almost exclusively: it consists essentially of forcing a hot, revolving, metal tool into a mass of plastic clay, retained in a plaster mold, the tool forming one surface of the insulator, and the plaster mold the other. A number of factors enter into the success of this operation, such as the design of the press and tools, the heat applied to the tool, the moisture content of the plastic body and the general character of the body used. A small high-duty press is used for manufacturing small insulators. A large, massive press, the largest used for this type of work, turns out the larger size insulators at the rate of several hundred units per hour.

Works of the Westinghouse High-Voltage Insulator Co. at Emeryville, Calif.

Manufacture of High-Voltage Insulators

Stimulated by the Rapid Expansion of the Electrical Industry, Ceramic Resources of the Pacific Coast Have Been So Developed as to Supply More Than 50 Per Cent of the Materials Required in the Production of Electrical Porcelain

By M. H. Hunt

Superintendent Westinghouse High-Voltage Insulator Co., Emeryville, Calif.

CERAMIC manufacture has been developed most extensively in the region east of the Mississippi River. The reasons are logical. The tendency has been due to the centralization of population, the presence of skilled labor, cheap fuel and the proximity of raw materials, both domestic and foreign. The ball clays of Tennessee and Kentucky, the kaolins of Georgia, Florida and the Carolinas, the feldspars of eastern Canada and Maine, the silicas of Pennsylvania and Illinois—these are all well-known, standard materials, the properties of which are understood by manufacturer and potter alike. Nevertheless the west coast, and especially California, is rapidly developing the resources of raw material in the region, and it is now possible to procure locally more than 50 per cent of the materials used in the manufacture of porcelain. This article has been written to give a brief exposition on the raw material and processes of insulator manufacture, with particular reference to operations at the Westinghouse company's plant at Emeryville, near the San Francisco Bay cities of Oakland and Berkeley.

Raw Materials

The raw materials used in present-day method of manufacturing high-voltage porcelain are, mainly, ball clay, kaolin, feldspar and silica, together, at times, with small amounts of fluxes such as calcium, magnesium and barium carbonates, talc, barium sulphate and calcium fluoride, although the latter two are so little used as to be negligible in importance.

Ball clays, in general, are characterized by high plasticity, shrinkage and strength, and non-porosity when fired to temperatures between 1,290 and 1,330 deg. C. They show a cream or tan color after firing, due to the presence of iron oxide. Ball clays are of sedimentary character, having been transported by the action of water and deposited on ocean bottoms where there is little or no movement. Naturally they are extremely fine grained. The ball clays of Florida, Kentucky and Tennessee are obtained from the Tertiary formations. The function of ball clay in an electrical porcelain body is to impart plasticity, or what may be called working property, and to produce a strong body that will withstand the strains produced during handling and drying.

Kaolins are residual clays, found overlying the rock from which they are formed. They are the residue from the decay of almost pure feldspathic rock. In general, they are pure white in the crude state, and develop only a slight plasticity when mixed with water; they are weak, mechanically, after drying. They retain their white color on firing, but present a perfectly porous structure, in contrast to the vitreous structure of a ball clay. Kaolins are usually washed, before marketing, by a flotation process, which eliminates free silica and mica.

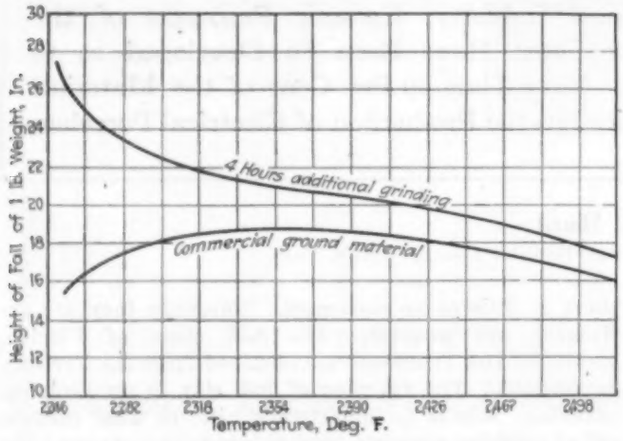
Nearly all porcelain bodies contain a mixture of these two types of clay, the quantity used of each depending upon the article being made. In the manufacture of insulators, it is general practice to mix them in about equal proportions. A high ball clay body gives excessive shrinkage and warping and produces a porcelain of poor color. A high china clay body has low plasticity, develops a weak structure, and therefore does not lend itself well to plastic body manufacture, whereas a mixture of the two produces a body with good workability.

Feldspars are of igneous origin and occur chiefly in granites. For ceramic use they must be almost free from impurities such as quartz, tourmaline, garnet, magnetite, beryl and mica. The function of feldspar in a porcelain body is to cement or fuse the whole mass into a thoroughly homogeneous and non-porous body. Good feldspars fuse to clear, colorless or milky glasses, almost free from specks, at temperatures varying be-

tween 1,275 and 1,295 deg. C. Electrical porcelain bodies are fired from 1,310 to 1,370 deg. C., which means that the feldspar has ample opportunity to exert maximum effect.

Silica occurs in various forms, both crystalline and amorphous, nearly all of which are suitable for some type of ceramic manufacture. For electrical porcelain, silica ground from either quartzite rock or white sand is extensively used. It serves as a non-plastic during the early processes of manufacture, and as a skeleton during the firing, increasing the stiffness of the body and enabling it to retain its shape.

The tests made on the raw materials, to determine their properties and to control their use in the porcelain body, have been incidentally enumerated in the above brief description. It will be noted that more reliance is placed upon the physical characteristics of the raw materials than upon chemical analysis. Experience indicates that it is undesirable to try to correlate



Effect of Fine Grinding Flint and Feldspar on the Resistance to Impact of a Porcelain Body

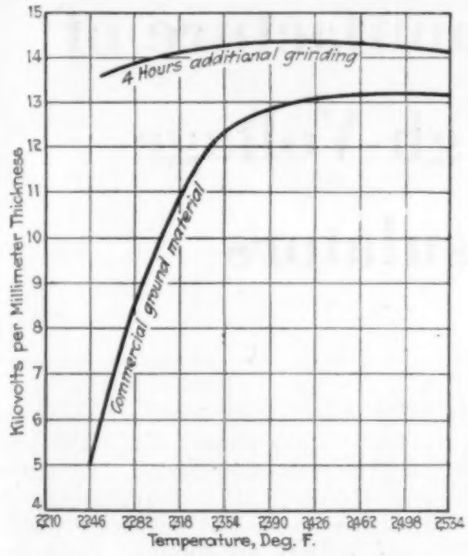
plasticity and shrinkage, and even fusibility and color, very closely by means of a chemical analysis. Moreover, physical tests are easily and quickly made and interpreted.

In the manufacture of porcelain on the west coast, it has been found possible to make use of several Western materials. Feldspar of excellent quality is available, as well as silica. Numerous plastic fireclays occur, but no true ball clay has yet been developed. At the present time the demand for high-grade ceramic materials, especially clays, on the west coast would not justify mining operations on the scale necessary to produce at a reasonable price. For this reason the clays are at present imported from England.

Body Preparation

It has long been recognized among ceramic engineers who have had the opportunity of experimenting with electrical porcelain bodies at temperatures between 1,250 and 1,370 deg. C. that the percentage composition only slightly affects the general properties of the porcelain so long as it is perfectly vitreous, workable and free from manufacturing strains; but it is equally true that the method of preparation does affect all the properties of the body, some beneficially, some adversely, and that a balance of properties must be sought and maintained.

The clays entering into the porcelain body are extremely fine grained, and it is necessary only to disperse thoroughly any aggregates of particles that may occur. This is done by placing the clays in a tank of water and agitating them thoroughly for several hours. However, the fineness of feldspar and silica depends upon how long and how carefully the miller has ground them, and in any case they are not fine grained enough to produce the best quality of porcelain to suit the requirements of the Westinghouse company. Therefore it is necessary to regrind these materials; this is done in the ordinary ball mill, using a definite quantity of water. The working properties of the porcelain body and the characteristics of the finished product are vitally affected by this operation. The accompanying curves will show that the dielectric strength and resistance to impact are both increased. The experiments were all conducted in



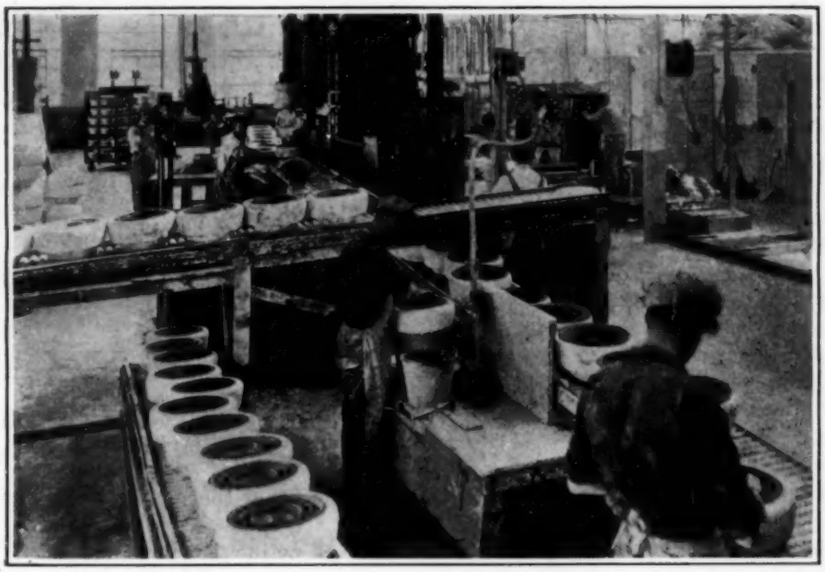
Effect of Fine Grinding Flint and Feldspar on the Dielectric Strength of a Porcelain Body

the type of mill used for the production of the commercial grades, but the time of grinding is not the same, although results can be correlated. The bodies were all fired in a commercial kiln.

There is a considerable amount of foreign material, mostly organic, in ball clays, even in those of the best quality. It is necessary to wash this out, but there is not enough of it to justify a separate operation. Therefore after the ball-mill charge has been dumped into the mixing tank, the mixture, which is in suspension in a large excess of water, is run through a series of screens, grading from coarse to extremely fine; all dirt is thereby eliminated. After passing through the screens, the body flows over a large magnetic separator, which removes any magnetic material picked up during

Typical Analysis of Raw Materials Used in the Manufacture of Electrical Porcelain

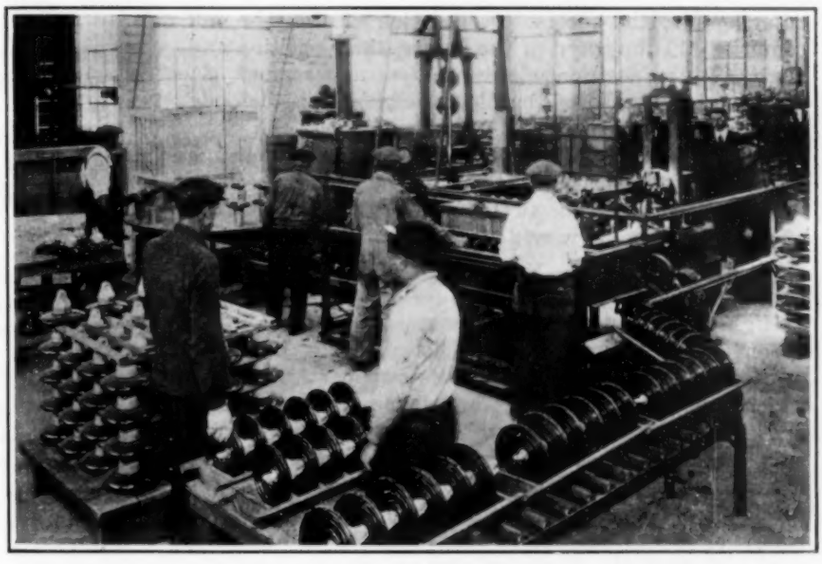
	Commercial Kaolin	Commercial Ball Clay	Theoretical Kaolin	Maine Feldspar	California Feldspar	Theoretical Orthoclase Feldspar	Commercial Quartz Sand
SiO_2	48.26	46.87	46.3	64.90	67.30	64.7	99.55
Al_2O_3	37.64	36.58	39.8	19.75	18.55	18.4	0.13
Fe_2O_3	0.43	1.14	....	0.12	0.005	.....	0.09
CaO	0.06	0.50	....	.....	0.96	.....	....
MgO	Trace	Trace	....	Trace	.....	.....	....
TiO_2	....	0.43	....	.....	.....	.....	....
Na_2O	1.56	Trace	....	2.68	2.96	.....	....
K_2O		1.60	....	12.04	9.55	16.90	....
S	....	0.06	....	.....	.....	.....	....
Loss on ignition	12.02	11.52	13.9	.....	0.64	.....	....
Moisture loss at 105 deg. C.	.....	1.60	....	.....	.....	.....	....

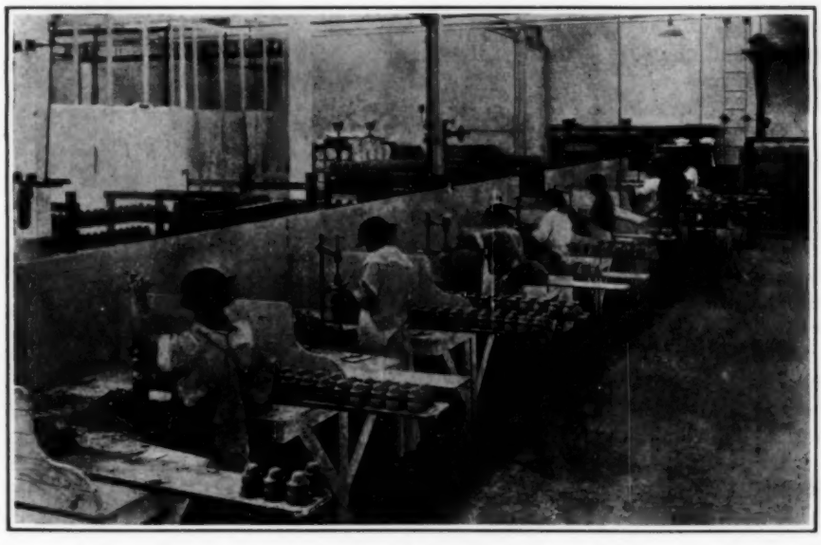


(LEFT) Note in foreground the operation known as fettling or trimming. The conveyor method of handling the product is used throughout the forming operation, after which it is loaded on racks for drying.

(BELOW) A view of the mechanical testing department, through which the insulator must pass before final electrical testing.

Where Manual Dexterity and Engineering Co-operate





(LEFT) After preliminary drying the molds are removed and the product trimmed to size. The operation shown here consists in cutting grooves for tie-wires and in trimming the top surface of the insulator.

transportation and handling, and is finally stored in large cisterns beneath the floor.

From these cisterns the body suspension is pumped into three 24x24-in., 72-chamber filter presses and the excess moisture eliminated, leaving a plastic mass, containing about 23 per cent water. From the filter presses the cakes of plastic body are passed through a special mill, which kneads and compacts them, producing a fairly homogeneous mass, which is stored in closed cellars for several weeks.

The question of aging has been much discussed, especially in reference to the effect it has on the quality of the product after firing. Undoubtedly the working properties of a body are changed in consequence of aging, but it has not been proved that the quality of the fired porcelain is improved thereby. Most porcelain factories in this country do not consider the benefits derived from aging sufficient to devote to it the large factory floor space necessary.

The aged clay is prepared for the insulator-forming process by pressing it through the ordinary pug mill, a machine that compacts the mass, works out air pockets and insures a uniform distribution of moisture, finally extruding it through a die. The principal factors entering into the successful operation of the pug mill comprise (1) the speed of the knives, their position and pitch, (2) the position of the push-out augers, and (3) the design and size of the die through which the body is extruded. A change in the character of the clays used or in the general body composition means a change in the design of the mill, which, for one thing, accounts for the reluctance shown by potters toward the use of raw materials of varying composition.

The Forming Process

High-voltage insulators, in general, are formed either by one or by a combination of hot pressing, jiggering or casting, each process having its own particular field, which depends upon the size and shape of the insulator and the use to which it is to be put.

In the Westinghouse factory the hot-pressing method is used almost exclusively; it consists essentially of forcing a hot, revolving, metal tool into a mass of plastic clay, retained in a plaster mold, the tool forming one surface of the insulator, and the plaster mold the other. A number of factors enter into the success of this operation, such as the design of the press and tools, the heat applied to the tool, the moisture content of the plastic body and the general character of the body used, especially in reference to the kind and quantity of clay it contains. A small high-duty press is used for manufacturing small insulators. A large, massive press, the largest used for this type of work, turns out the larger size insulators at the rate of several hundred units per hour.

Drying and Inspection

The drying process is divided into two stages: The first, a preliminary drying in the plaster mold; the second, a final drying after the unit has been trimmed and smoothed into its final shape. In the preliminary drying the plaster mold absorbs a small quantity of water from the surfaces of the plastic clay and a slight contraction results. During this period of half an hour or more, evaporation has taken place from the upper surface of the insulator to harden it sufficiently to allow the shape to support its own weight, after which it can be taken out by inverting the mold and is then supported on a pallet.

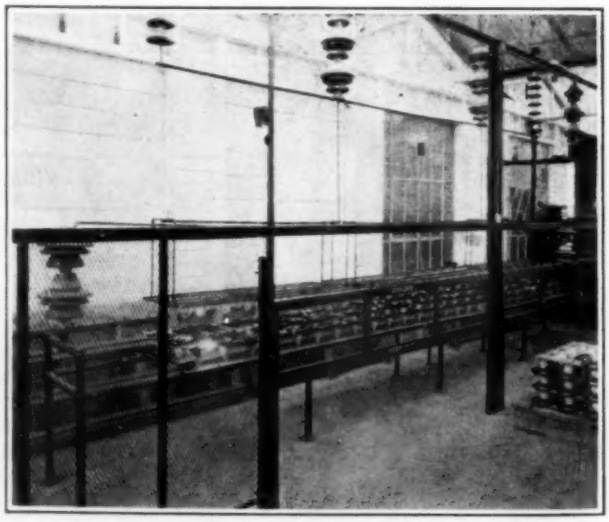
Coating the Ware From the Drier With a Glaze Slip
Particles of ground dry body are applied to those surfaces on which a cementing bond is needed

The surface in contact with the mold is usually slightly roughened, due to contact with the plaster, and must be cut away to a depth of approximately $\frac{1}{8}$ in. This operation is done by revolving the unit on a vertical spindle, while an operator skims the surface with a small wire tool. The tiewire groove is cut in this operation, and the unit is sponged before it is taken off the machine and placed on a truck. An inspector passes on all the work done in this department. The material is then dried finally as described under the photograph of the drier on page 728 and inspected once more before being glazed.

Glazing

The glaze is applied to insulators by dipping or by spraying. Dipping is more generally used, because it is quickly accomplished with simple apparatus; moreover, it lends itself readily to the numerous sizes and shapes that comprise a day's output. The operation consists of immersing the insulator, unfired, for a couple of seconds, in a tub of glazing compound, suspended in water. A coating of approximately $\frac{1}{32}$ in. thickness deposits on the insulator, which, in the firing operation, fuses to a clear, dark-colored glass.

Insulator glaze is usually a natural clay, which fuses to a glass at the temperatures used. Manganese diox-



Testing the Final Insulator With a 200,000-Cycle, 250-Kilovolt Current

ide, red oxide of iron and chromium oxides are frequently added in small amounts to intensify the color produced.

Firing

The firing of electrical porcelain follows the same principles that are recognized in the burning of any ceramic ware. The operation can be divided into four general stages: (1) Expulsion of the water held in the pore spaces of the ware; (2) expulsion of the water of crystallization of the clay; (3) oxidation of organic material, and (4) hardening or vitrification.

The evaporation of the pore water takes place from atmospheric temperatures up to approximately 400 deg. F. The water of crystallization begins to be given off at approximately red heat, which is about 930 deg. F. The oxidation period is between 1,290 and 1,470 deg. F. Vitrification takes place between various temperatures, depending on the composition of the porcelain body, the fineness of particles present and the rate of temperature increase. The feldspar in the body begins to sinter at about 2,000 deg. F., which can be considered the beginning of the vitrification period, but does not produce its maximum effect until the neighborhood of 2,350 deg. F. is reached.

The insulators are placed in the kiln in saggers—round or square fireclay boxes. The purpose of these is to protect the insulators from the direct impingement of the combustion gases during firing and to afford a means of loading the kilns. The number of insulators in a kiln depends upon their size, and varies ordinarily from 2,500 to 7,000. The kilns are fired by gas and fuel oil, the gas being used in the early part of the burn, when low temperatures are desired. The firing period lasts about 68 hours.

Inspection and Testing

After the kilns are unloaded, each insulator is given a visual inspection before it is tested, principally for cracks, the threaded pin-holes being checked by the use of a steel gage. An insulator that shows a crack must be discarded. Cracks and other irregularities on the surface of insulators collect dirt and so decrease insulating efficiency.

The electrical testing of an insulator consists of applying a sufficient voltage to it to cause arcing over its surface. This arc is sustained for from 5 to 10 minutes. Insulators with flaws or imperfections will puncture—they will cease to arc over. The current will pass to ground through the place of weakness. When this happens, the unit is taken off the rack and the test continued.

The voltage required for testing depends upon the shape of the unit, which, of course, controls the arcing distance over its surface. Test losses in modern insulator works should be less than 2 per cent, although it is not considered poor operation for this loss to amount to 5 per cent. Two testing outfits are in use in the Westinghouse factory. One is a 300-kva., 250,000-volt, sixty-cycle transformer, regulated by a 69-kva., 220-volt induction regulator. The other is a 200,000-cycle, 250-kilovolt, high-frequency transformer. Test voltages are indicated on either a crest voltmeter or ratio voltmeter.

After passing the first electrical test, those insulators requiring hardware are assembled with cement and steam-set, after which they are given the final or assembled tests and are ready for packing and shipping.

Metal Spray Coatings for Hot Oxidation Resistance

By Carl Commentz, Dr. Ing.
Hamburg, Germany

Of the many German applications of the spray-coating process using the metal-spraying pistol, one of the most important is the coating of iron parts with aluminum for protection against flame. Protection by this process owes its efficacy to the fact that the aluminum soaks into the iron upon exposure to heat and an alloy is formed which cannot easily be removed. At the same time the surface of the aluminum burns to form a protective oxide coating which has a melting point of 4,200 deg. F.

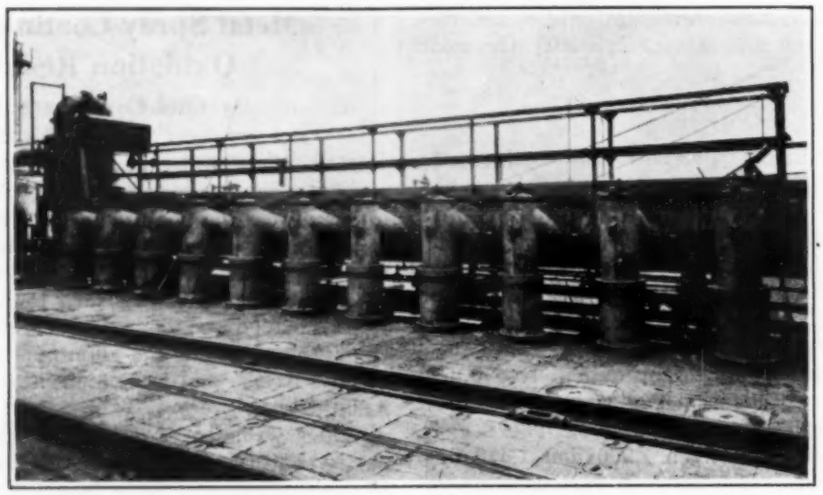
When wrought iron or mild steel is treated, the entire coating of aluminum rapidly soaks into the iron if a temperature of more than 1,850 deg. F. is attained. It is, therefore, necessary to renew the coating until the soaking-in ceases. When hard white cast iron or gray cast iron is treated, the soaking-in effect is much smaller, and for this reason a single coating with the spraying pistol is sufficient to make the metal resistant against high-temperature oxidation.

The coating of fire bars for boilers has proved to be exceedingly advantageous. Spraying the aluminum upon the upper surface of the bars and for about an inch down on each side is sufficient to protect them. Tests made by the Austrian Railway Department using the wrought-iron fire bars coated with aluminum have shown that these bars have a life six times that of the bars previously used. The most extensive trials that have been made in stationary boiler service are those at the Altona Gasworks, Germany, where the middle bars of a grate were sprayed, while the side bars, not so much exposed to the heat of the fire, remained uncoated. After 162 days of normal service the coated fire bars proved to be fully intact, while the side bars had lost 18 per cent of their weight and it was found necessary to replace them by new ones.

The principal advantage of such coated fire bars lies not in the greater life that is realized but in the improved condition of the bars. On uncoated bars there are formed, at the points where the hot coal touches them, slag particles which dissolve the cast iron so that the coal sticks to the bars. The openings between the fire bars are then choked up and the temperature rises, aggravating the condition. Sticking of coal to the coated fire bars is impossible on account of the aluminum oxide skin, which melts only at 4,200 deg. F. Thus the cleaning of the fires is made much easier, the combustion is much more complete and a greater efficiency is obtained.

Cement Paint Contains Boric Acid to Retard Setting

Spencer B. Newberry, of Cleveland, Ohio, adds boric acid or a borate and a hygroscopic salt to cement for the purpose of retarding setting so that the mixture may be used as paint. Cement with the addition of 0.1 to 1 per cent boric acid and 1 to 10 per cent calcium chloride may be kept in closed containers in dry form and mixed with 40 to 60 per cent water to form a cream that may be applied by brush or spray. (Patent 1,510,795, assigned to Medusa Cement Co., Cleveland, Oct. 7, 1924.)



They Had to Build a Special Small-Size Coke Oven for the Job

Five Ordinary Ovens Would Have Supplied Enough Gas for Battle Creek

THE Battle Creek battery of eleven Becker-type ovens, each with a coal capacity of 6.8 tons per charge, was designed on principles clearly established first by the experimental battery of five ovens in the Chicago By-Product Coke Co. plant. On a larger scale these ovens have been tried with success also in several other plants, notably in the 366-oven addition to the Clairton, Pa., plant of the U. S. Steel Corporation.

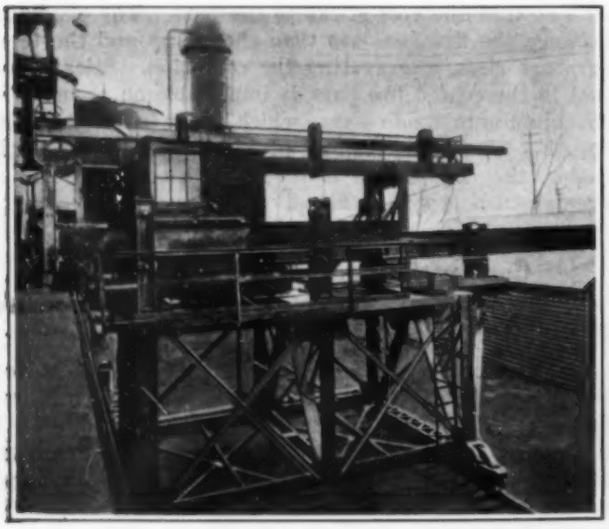
All these earlier batteries had, however, been full size "coke" ovens, heated with oven-gas from fuel gas lines on both sides of the battery, usually with a coal capacity of 12.5 to 16 tons per charge. Clearly only five or six such ovens would be sufficient for Battle Creek and a battery of as small a number as that was impractical except for experimental purposes. The obvious thing to do was, therefore, to use a smaller unit in larger numbers. This was done without loss of the essential elements of the larger oven, simply by making the oven shorter, about 23 ft. inside length instead of 35 to 42 ft. as commonly found for coke ovens.

Reduction in oven length had numerous mechanical advantages. In the first place, a single fuel-gas line on one side of the battery serves to heat the entire length of the ovens. As the coal charge is smaller, a smaller larry car and corresponding lighter construction of battery machinery are possible. With shorter ovens and smaller charges, the coke-pushing, receiving and quenching equipment is correspondingly smaller and less expensive. These and other modifications in mechanical requirement all contribute to a lessening of initial costs for machinery without in any way affecting the certainty of operation, the quality of coke, or the yield and quality of byproducts. In a word, the efficiency of large-unit production has been adapted to small-plant conditions.

Some Details of the Oven

At the top of the page the gas outlets from the individual retorts are shown leading into the gas main. Note also in the foreground the track on which the charging equipment is moved from oven to oven.

Below on the left is the ram for pushing the coke out of the retorts into larry cars and on the right the doors through which the coke is pushed. Note the aprons and quick release clamps.



City Gas From Coke Ovens?

Economically impossible. At least that would have been the cry till recently. Now, however, it has been accomplished and the method is of direct interest to every operating man

By R. S. McBride
Assistant Editor, *Chem. & Met.*

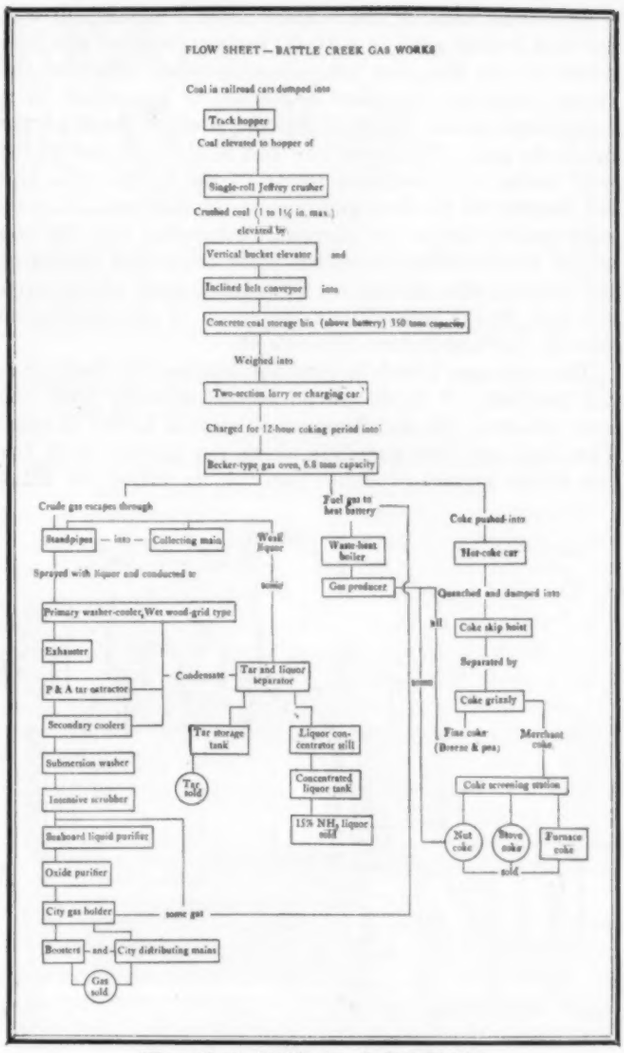
THE first installation of the small-size gas oven of the Becker type was built by The Koppers Co. in Battle Creek, Mich. That plant was a pioneer effort, not only technically but also economically, for it was the first attempt to meet the requirements of a city with widely fluctuating gas demand by means of a small battery of chamber ovens. Previously such small installations were regarded as not practical and in no case before had operation of coal-gas equipment alone been attempted where the daily sendout practically doubled from one day to the next.

But such great success has followed this pioneer effort that already other similar plants are either under construction or contracted for. Moreover the industrial user of gas should interest himself in this plant quite as much as the gas-works manager, for it points a new way to low cost fuel gas for industry.

The sendout of gas in Battle Creek on a normal business day is about one and three-quarter million cubic feet; but of this total more than 40 per cent is for industries that operate only 6 days a week. Therefore as closing time approaches on Saturday evening the demand drops sharply and the Sunday sendout is only about half that of week days. The holder capacity of the plant is limited—in fact, it is less than normal for works of this size. Hence there is no chance to store up the Sunday make for later distribution. The only solution is to make less gas.

Any coal-gas operator well knows that he cannot quickly cut his plant output to 50 per cent and again speed up to capacity about 36 hours later without grave danger to his refractory settings and intolerable variation in quality of both gas and coke made. The bench of retorts and the battery of ovens must function at as nearly uniform temperature as possible and with normal rates of charging. Thus the coke-fired bench and the oven-gas fired battery, which are the normal types, are operated with little change in rate of gas production throughout the year. Such changes as are desired are made slowly and only as the necessities for changing seasons demand. Day to day fluctuation in gas demand is met largely with water gas, which can be made efficiently in widely varying quantities. This, in fact, was the old system at Battle Creek.

Producer-gas firing of the battery of ovens was developed to afford greater yields of coal gas for sale than were possible when 35 to 45 per cent of the "make" was used for heating the ovens. With producer gas for this latter purpose, all the gas made became "surplus" for sale; but the operator also gained the opportunity to determine from day to day whether only part, all or none of the ovens should be heated with the producer gas. And as he thus varied the use of producer gas for fuel, he also varied the quantity of oven gas for sale to equal extent. By this means flexibility in sendout was achieved without resort to water gas. This development represents a new type of gas plant, especially suitable for cities of intermediate or small size.



Flow Sheet, Battle Creek Gas Works

The Becker type gas oven as installed in Battle Creek differs from the former types made by The Koppers Co. primarily in its heating system. When producer gas is used for heating, it is preheated by regenerators before entering the heating flues. It is unnecessary to preheat oven gas due to the absence of inerts. In either case the air used is preheated in the regenerators, which are built into the battery beneath the ovens.

The Battle Creek installation was necessarily restricted both by the ground space available and the need of using the old coal-crushing and elevating machinery. The space on the coke side of the battery was so restricted that door machinery and operating platform of the usual type could not be used. But these minor features in no way affect the general similarity to coke-oven style, operation and character of products.

The usual heating gas is made from a mixture of nut, pea and breeze coke in a 10-ft. inside diameter gas producer of the Kerperly low-pressure type. Most of the steam required for plant operation is generated by a waste-heat boiler operated by the sensible heat of the producer gas. The producer gas is cleaned and cooled with water in a scrubber tower of the hurdle type and led directly to the fuel gas line on the battery. A pressure-control device, or governor, connected into the top of the producer regulates the blast under the grates at the base of the producer. This takes care of the oven reversal period and adjusts the speed of gas making so that no fuel-gas holder is required.

The oven gas which is used for heating the battery is not purified. It is drawn as needed directly from the lines ahead of the purifiers, so no special holder is used. This fuel gas line parallels along the battery wall the one which carries producer gas and its valves are actuated by the same reversing mechanism as that normally used with producer gas firing.

In the 30-minute interval between reversals the pin connecting any producer-gas line can be removed and the oven-gas line to the same oven be connected instead. Thus any number from one to all the ovens can be changed over from one kind of gas to the other. The adjustments on each oven are already so carefully made that this is done without any appreciable change in oven temperature. The only limit to the speed of change is the rate at which the producer can pick up the load or have its fires banked.

The plans of the constructing company for this system took into account the desire of the gas company to use fine coke for producer-gas making. It was therefore arranged that this producer should have sufficient gas-making capacity to fire the battery when burning coke containing not over 40 per cent breeze. With this fuel it was expected that not more than 275 lb. of coke and breeze would be required per ton of coal carbonized. These, as well as other operating estimates of the erectors, have been very satisfactorily met.

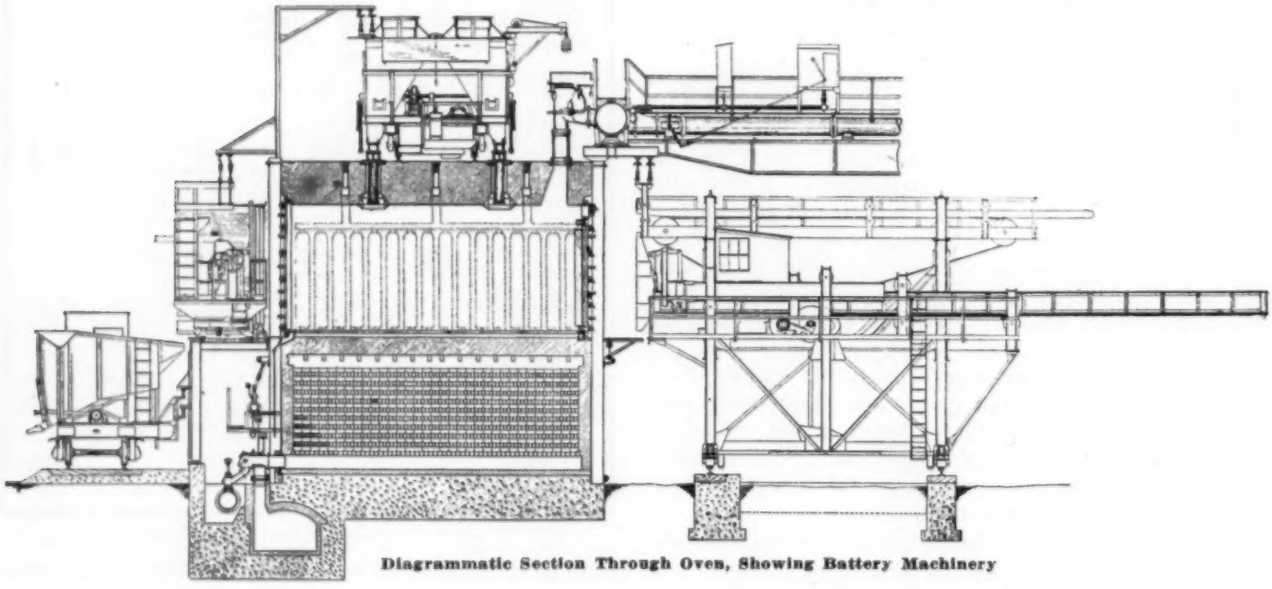
The Battle Creek plant uses a straight high volatile coal of about 32 per cent volatile matter from the Youghiogheny district. With this coal crushed by a single roll crusher to pass 1 to 1½-in. mesh, the coking period is 12 hours for a 6.8-ton charge. The eleven-oven battery has, therefore, a capacity of about 150 tons of coal per 24-hour day. Two shifts of four men each take care of all charging, battery operation and coke handling up to the point where the coke is run to the bins for the gas producer or for the domestic sales.

The first 5 months of operation, beginning with January, 1924, gave results as follows:

Coal carbonized	4,300 to 4,500 tons per month
Coke yield	1,360 lb. per ton of coal
Ammonia yield	6.16 lb. NH_3 per ton of coal
Tar yield	12.5 gal. per ton of coal
Gas yield	6.06 cu.ft. per lb. of coal
Heating value of gas	550 B.t.u. per cu.ft. (approximate)

These average yields have been exceeded during certain months, notably in the case of ammonia, which at first did not come fully up to the expectations, but which was well above the estimated yield of 6.5 lb. of NH_3 per ton of coal during May, reaching 6.64 lb. The gas yield will also be better than this average, probably exceeding the builders' estimate of 6,300,000 B.t.u. in the gas per ton of the particular coal treated, and this without any steaming of the ovens.

Even throughout these first months there has been no difficulty in maintenance of the 12-hour coking period, nor in reaching 150 tons of coal capacity daily.



Diagrammatic Section Through Oven, Showing Battery Machinery

Reclaiming Waste Vulcanized Rubber

In reclaiming vulcanized waste from which fibrous material has been removed, by the process developed by Joseph H. Russell, of Naugatuck, Conn., finely divided waste is placed in an iron autoclave having an agitator. For every 100 lb. rubber, 12 gal. of methyl ethyl ketone and about 10 lb. of caustic soda, dissolved in the minimum amount of water, are added. The contents of the autoclave are heated to 332 deg. F. for 9 to 12 hours. After cooling, the liquor is drained off and the recovered rubber washed, dried and finished according to usual methods. The ketone swells the rubber, enabling the caustic to penetrate and thoroughly devulcanize. (Patent 1,510,706, assigned to Rubber Regenerating Co., Oct. 7, 1924.)

Facts and Fakes Among Cracking Processes

An Intensely Interesting and Human Account of What a Real Chemical Engineering Development Has Meant to a Great Industry, to Technology and to the Public

By R. H. Brownlee
Consulting Petroleum Technologist, Pittsburgh, Pa.

FROM the time of Frasch's epochal invention in the '80s that made sulphur-containing oils valuable to refine, until the filing of the Burton application for cracking, no patents of the first order of immediate importance to the petroleum industry had been issued for the refining of oil.

During most of this period the Standard companies almost wholly dominated the refining industry and the chief thorn in the flesh of the populace in general, and the village editors in particular, was the price of kerosene.

With the dawn of the twentieth century, however, a new industry was emerging from its swaddling clothes and beginning to evolve strange and unusual machines that emitted various startling noises ranging all the way from a rather raucous purr to staccato pops and bangs. When traced to their sources, these strange interruptions to the usual peace and quiet of the countryside were found to be caused by the fact that these strange machines drank a product hitherto chiefly useful for removing from their previous whereabouts those thoughtless individuals who persisted in trying to utilize it for lighting the fire in the kitchen stove. This infant of scarcely more than two decades ago has grown to man's estate and his development has been one of the wonders of the age. Within the first decade of this century his appetite for liquid refreshment grew to an alarming extent, and quite naturally the little old overworked law of supply and demand was dusted off and brought forth with the usual inevitable results.

The almost waste product, the light distillates from crude oil, which first came over from a still when heat was applied thereto, became of increasing importance and, again quite naturally on account of the aforesaid law of supply and demand, the price of these distillates began to rise. It was only a few years before the bugaboo of the refinery became the blue ribboner and kerosene had to take a back seat.

During the first of these decades the automobile began to be taken seriously. People realized that the horseless carriage was here to stay; not to remain as it was, but to continue its process of evolution until its manufacture became one of our great industries or, to be more precise, a group of our great industries. Incidentally it played an important rôle in making the already great petroleum industry even greater. The making of motor cars has become our third industry in point of value of manufactured products and is the third and largest shipper of manufactured goods upon the railroads. There are in use in this country alone almost exactly as many motor cars as there are telephones.

By 1910 it had become apparent that if we continued to use existing methods of production it was a question of only a very short time until there would not be enough gasoline to run all the new pleasure cars, not to mention trucks, motor boats and airplanes.

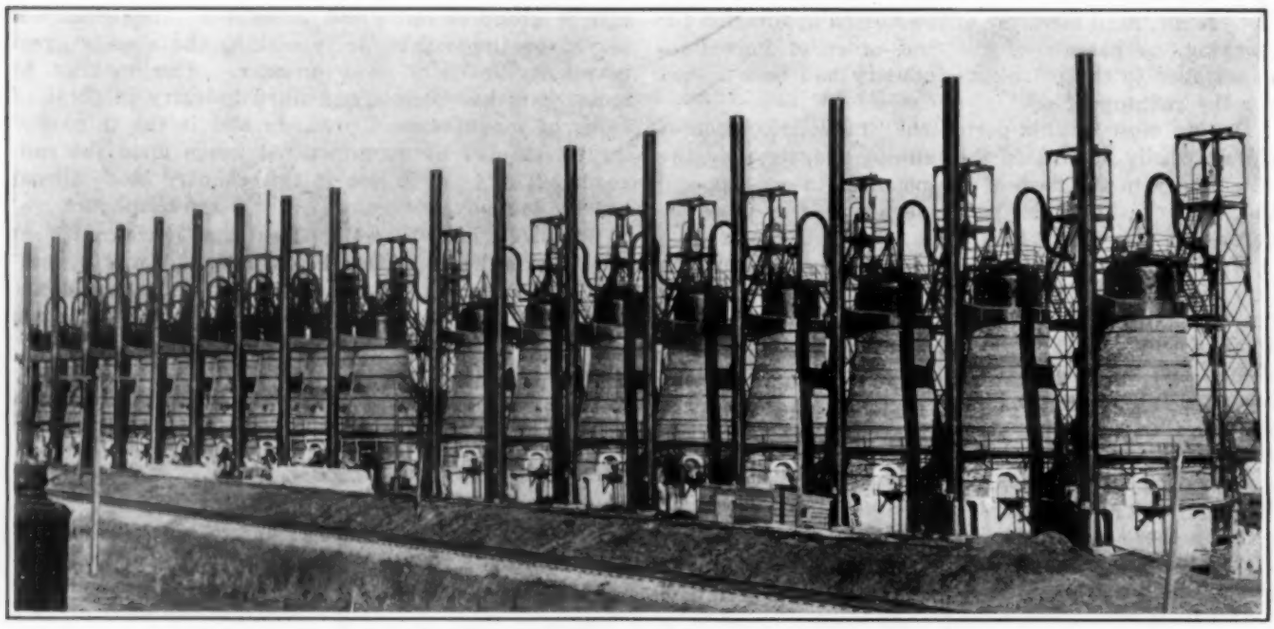
In 1912 the first real commercial cracking plant was built, and since that time there has been a constant increase in the proportion of cracked gasoline as compared with the straight-run product. Up to this time scarcely 10 per cent of the volume of crude oil of the United States had represented the available supply of gasoline. With the amazing development of cracking, this figure could easily be multiplied by 5 or 6 without interfering with the production of necessary lubricants. By 1915 there were 1,000,000 automobiles in use, and this number was being added to at the rate of 1,000 per day. Now we have in operation nearly 15,000,000 automobiles, or 83 per cent of all the automobiles in the world.

The straight-run gasoline of all the crude oil produced in the world would not suffice to run the American pleasure cars. There is an old saying, "You can't make soap out of goose grease," which is on a par with the statements of a considerable number of wise men only a few short years ago to the effect that you can get out of crude oil only as much gasoline as there is in it. The first wise saying was probably evolved by the wise boy who wanted to save the goose grease with which to grease his hair and the latter by the ever-present men who know it can't be done because it hasn't been done. Far-seeing men realized the coming demand and today there is gasoline for every man, woman and child in the United States to step on.

There are more automobiles in this country than there are telephones, and yet, as Dr. Brownlee tells us, "there's gasoline for every man, woman and child to step on"! Where does it all come from? Last year the various cracking processes gave us two billion gallons, or more than a quarter of the total output of 7,555,945,143 gal. The amazing technical development that made this record possible is a romance that should thrill every reader of *Chem. & Met.* Seldom if ever has the story been told with more authority or in such a genuinely interesting way. You will enjoy reading it.

While cracking was being developed, other means of increasing the supply of gasoline were also being utilized and we have increased our supplies by extracting it from natural gas both by compression and absorption methods. Furthermore, the end point or final boiling temperature of the product has been increased from 350 deg. F. to 437 deg. F. and in some cases even higher. This has in turn caused a change in the physical tests of kerosene, for as formerly we took off approximately a 350 deg. end-point gasoline from the kerosene and made accordingly, to meet state laws, kerosene having a flash temperature of 110 deg. F., we now take off the lighter part of the kerosene to add to the gasoline and have thereby rendered obsolete the state laws specifying flash point of kerosene.

In spite of all of the increases in yields of gasoline from all sources, last year there was produced by cracking approximately 2,000,000,000 gal., or more than 25 per cent of the total of 7,555,945,143 gal., as shown by the production figures of the Department of the Interior through the Bureau of Mines. These figures represent an increase of 21.83 per cent over the 1922 output. The total domestic consumption amounted to 6,685,035,280 gal. Exports were 871,116,614 gal., which, added to the domestic demand, shows a total demand for the year amounting to 7,556,151,894 gal., an increase of 26.64 per cent over the total demand of 1922. Even with our enormous production of crude oil, we would have inadequate supplies of gasoline without resorting to cracking processes.



An Eighteen-Unit Fleming Cracking Plant at the Refinery of the Marland Refining Co., Ponca City, Oklahoma

Pioneer Petroleum Research

About 1910 the capable research men in all the refineries who were really employed upon research could have been counted upon the fingers of one's hands, for the relatively few men of this type available were employed as executives, foremen or on mere routine control work. However, the rapidly increasing consumption and prices of gasoline began to influence even some of the most static companies to cast about and see what could be done to prevent the impending gasoline shortage. Small groups of men in the larger refineries began working upon the problem and a few individuals with more enthusiasm than knowledge of oil, physics or chemistry, and without adequate facilities, financial or otherwise, were laboring assiduously to produce greater yields of gasoline from crude oil or gasoline from distillates or residues from which the gasoline had been distilled. To illustrate with a personal anecdote the small scale upon which even the large refineries tackled the problem, it may be stated that as recently as the first of 1912 the writer, then employed by the Standard Oil Co. of Indiana, made the request of Dr. Burton, the general manager, that he be permitted to work upon increasing the yield of gasoline. He was told that already the company had two chemists working along this line and while anyone who might suggest a practical solution to the problem could have almost anything he wanted, nevertheless they did not feel justified in employing another man along this line. This was scarcely 6 months before the first Burton still, now known the world over, was under construction and less than a year before the original Burton patent was issued. It therefore seems apparent that these two researchers must not have needed further assistance.

Then Came the Faker

Within this time the original shell-type cracking still was developed and not many months later the first installation of forty stills was under operation at Whiting, Ind. The original Burton patent proved to be the leaven that stirred the imagination of everyone in any way connected with oil. Countless conscientious workers, both with and without facilities, were stimulated to emulate or improve this notable achievement, and naturally some individuals without either the mental or physical equipment saw a chance for fame and fortune. From the former have come many valuable inventions and from the latter some interesting sidelights tending to prove the old adage, "A little learning is a dangerous thing." For example, there was the case of the cleric who learned that petroleum is made

up of compounds that consist of chains of carbon atoms with hydrogen atoms attached thereto. Compounds consisting of short chains were gases, longer ones gasoline, still longer ones were kerosene and so forth to gas and fuel oil, which consist of long chains of carbon atoms. Ergo, the obvious way to make gasoline is to arrange a series of knives to cut up the longer chains of gas oil and fuel oil into lengths proper for gasoline.

Strange as it may seem, the Patent Office replied to his application for patent to the effect that the process was inoperative. The inventor, when last seen, was looking for some unsuspecting scientist or other to make affidavit that the scheme was valid. When asked if he had ever tried to operate his process, he seemed to consider this a purely superficial inquiry, as he admitted he hadn't, as that would cost too much.

Then another individual was told in a dream what to put into heavy oil to change it into gasoline and at any rate caught some individuals with itchy money who were afraid it might be so. The element of cost seems to have over-influenced the mental operations of some other parties, as they started upon the assumption that petroleum is too expensive to start with and besides is about to become extinct and they hit upon a source of starting material that is widely distributed and cheap—namely, water.

Getting Power From Water

Ten years ago, when the European war started, this process had developed to the stage where a handful of material added to a pail of water (size of pail immaterial) would produce a product with more power (25 per cent is the usually accepted figure) than gasoline, and since the water cost nothing and the chemicals could be purchased at any drug store, the cost of this vital fluid was estimated to be about 3 cents per gallon. Now, with such a material as this, a submarine could sail around the world without refueling, drawing most of its power from the ever-present briny deep. It was natural, therefore, that with a real war in progress and the fuel problem becoming serious even in its early months, such an alleged invention should arouse the interest of European Powers. Accordingly it was arranged to have the inventor meet the late Lord Northcliffe, who was in New York in the interest of securing supplies for the Allies. The meeting occurred in Lord Northcliffe's hotel, and in substance the chief conversation was about as follows, according to the account of an ear- and eye-witness.

After the introductions, Lord Northcliffe turned to the alleged inventor and said, "So you have come all the way from Wheeling and how did you come?" "I came in my car." "You say this new product which you make and which Mr. Blank has been telling me about can be made for 3 cents a gallon and operates a car much better than gasoline?" "Yes." "Then I suppose, of course, you used it in your car on the way?" "Well no, gasoline-filling stations are so conveniently placed along the road, I just filled up at them." "Then good day, gentlemen, I believe this is as far as we need carry this conversation," and Lord Northcliffe turned on his heel and walked away.

As preposterous as such an idea as cutting the chains in a hydrocarbon compound appears, yet patents have actually been issued upon processes just as far from practicability when they are carefully scrutinized. Whether or not an affidavit in this particular case was secured or the patent issued is not known. As is generally understood, the issuance of a patent is no guarantee of the value of the invention, although the invention is supposed to be operative. Quite naturally many cases must be passed upon which it would be impossible for the examiners to decide whether or not they will work and recourse is had to an affidavit from the inventor or others.

To understand how such obvious fakes as have inveigled public interest can do so for any considerable length of time would require psychological inquiry far beyond the scope of the present article. It is a fact, however, that something like the above instance thrived with modifications over a period of at least 10 years, and at various intervals sprang into public print.

Gasoline by Impact

It is well known that the impact of solids develops heat and tends to disintegrate them just as when a stream of water impinges against a solid object or another stream of water it breaks into spray, the fineness of which depends upon the velocity of the stream, shape of object struck and other conditions. The greater the velocity the finer is the spray. Hence is it not conceivable that if petroleum, especially if highly heated, be impinged at high velocity, might not accomplish the result of not only breaking up the particles of oil into very minute ones but of actually breaking up the molecules into smaller ones? In other words, to crack the whip with a long chain of carbon atoms and snap off a few droplets of gasoline. It is possible to shoot a jet of liquid from a nozzle at a pretty high speed, say that of a rifle bullet, 3,000 ft. per second. Oppose two such jets—that is, firing them point blank at each other—and we have the effect of twice the above velocity, or 6,000 ft. per second. At a velocity of more than a mile per second our oil particles are going to meet with quite a crash, so why shouldn't they break up into smaller ones and even smaller molecules?

Experience with other objects like collisions of automobiles and trains teach us to expect the inevitable. Let us see just what the inevitable is, however, in the case of atoms and molecules.

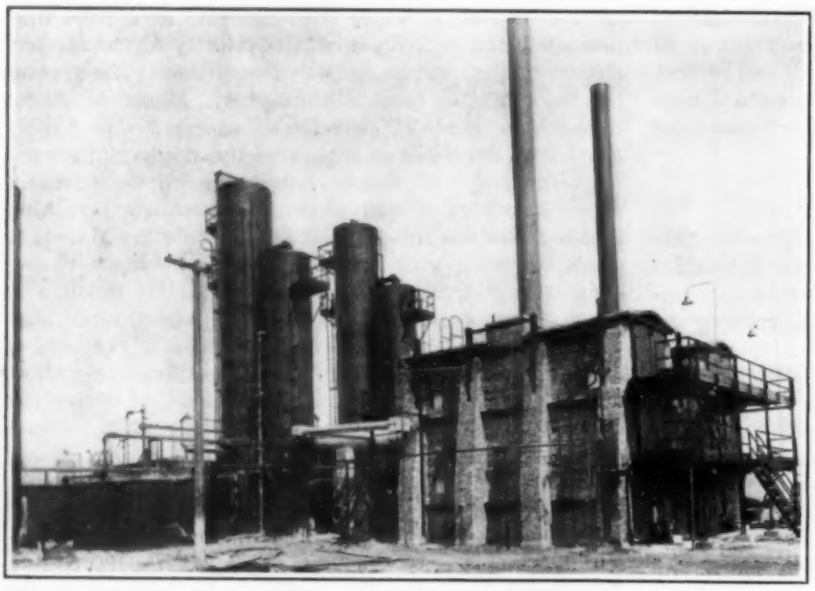
Atomistic Philosophy

Frederick L. Allen in "A Little Lecture on the Atom," *Harper's*, March, 1924, says: "Possibly the most brilliant experiment to determine the minuteness of the atom was that performed by the famous Norwegian physicist Nils Bjosh, when he placed in the left-hand pan of an extraordinarily sensitive balance (which we shall call pan *A*) the minds of three Congressmen selected at random (he does not specify their political affiliations) and in the right-hand pan (which we shall call pan *B*) three atoms, likewise selected at random. At the drop of a hat the scales were released, and after a moment's hesitation Pan *A* gradually sank, outweighing Pan *B*, amid the applause of the assembled academicians. Need I say more?" In the language of the day, I'll say he needn't. In order, however, not to become too personal and have to restrain ourselves from mentioning specific names of Congressmen or would-be Congressmen and thus render ourselves liable for libel, let us leave politics out for the present and for as long as possible and state it in another way.

Another of our popular magazines recently discussed some of the wonders of the atom as developed by one

of our most famous physicists, Dr. Robert A. Millikan. In this article the statement is made that if we multiply the size of a hydrogen atom by 10 billions, it would be about 3 ft. in diameter. Imagine, if you will or can, a soap bubble 3 ft. in diameter with a small particle called a nucleus with a positive charge of electricity at the center and a minute object with a negative charge of electricity only one two-thousandths as large as the nucleus flying about the circumference of the soap bubble. The nucleus of hydrogen is one one-hundred thousandth the diameter of the atom and the largest known nucleus is one ten-thousandth.

Now an atom of carbon is considered to be similar to an atom of hydrogen, having a central nucleus but also having several electrons flying about it. It is necessary therefore to consider a simple molecule of methane to be made up of a carbon atom which has a central nucleus with electrons or charges of electricity moving about it much as our solar system and grouped about it four hydrogen atoms, each consisting of a nucleus with a single electron or charge of electricity. Stated in terms of modern physics, a molecule or smallest particle of methane we can imagine is made up of five nuclei surrounded by rapidly revolving electrons. In a similar manner liquid and solid hydrocarbons are conceived to be made up so that the complexity we must assume even with what would be a single light constituent of straight-run gasoline, say hexane (C_6H_{14}) with all the twenty nuclei, each with its electron or group of electrons, is truly alarming. What is the complexity when we realize the untold millions of these groups that would be contained in a gallon of gasoline? Keep in mind that the electrons move at a rate of 200 miles per second while we return for a moment to recall that by pointing two jets of oil point blank at each other, we get a velocity of impact of 6,000 ft. per second, or roughly, slightly more than one mile per second. How much effect will a collision of particles of oil at one mile per second have toward breaking up a combination or group of elements composing a definite compound in which most of its members are moving at 200 miles per second? Evidently, the maximum theoretical effect on any one such pair of particles striking would be almost negligible. Add to this the fact that owing to the relatively immense spaces within the atoms and molecules, the probability of striking is enormously minimized, so that so far as any actual practical effect toward cracking is concerned, one would not expect anything.



A Modern Cross Process Plant in a Texas Refinery

Two 1,000-bbl. units are shown in this photograph, which also reveals a recent improvement by which bubble towers have been substituted for the old type of dephlegmators that were formerly used. The result of this change is that instead of yielding a so-called "synthetic crude" that must be redistilled, the final product is a gasoline distillate.

What Do We Mean by Cracking?

We may consider petroleum as made up of a lot of different length chains of carbon atoms to which are attached hydrogen atoms. The attachment of these hydrogen atoms is apparently analagous to the grouping of planets in associated solar systems. While not actually attached, they are evidently held by an invisible force, probably electrical, that while allowing the parts thereof to circulate at terrific speeds, yet hold them within definite spheres of influence. Beginning with methane with a single carbon atom, we go step by step to a chain of more than thirty carbon atoms. So gasoline might be said to consist of compounds containing chains of from four to ten carbon atoms, and heavier products have, for the most part, a larger number of carbon atoms. Hence, since by cracking we mean production of gasoline from compounds with longer chains of carbon atoms, it means the breaking up of the long chains to shorter ones. The aim in operating a cracking process is to produce the maximum amount of compounds with chains of carbon atoms within the range desired for gasoline and to avoid the formation of too large a percentage of short chains or gases such as methane and ethane, or even the breaking off of all the hydrogen and leaving free carbon. To cause the breaking up of these long chains we must apply some form of energy. Ordinarily we have applied energy in the form of heat, so in general we may consider that by means of heat we cause such violent motion within the molecule of petroleum that the molecule breaks up, thus forming smaller molecules. Since by far the greater proportion of hydrocarbons in crude oil distill under atmospheric conditions with only slight decomposition, it is necessary to apply pressure so as to raise the boiling point in order to apply sufficient vibration within the molecules to cause a rupture.

Since, as indicated above, the electrons evidently consist of negative electrical charges and the nucleus

carries a positive charge, why might it not be possible to utilize electricity (not as heat) to decompose the heavier oil? As a matter of fact, this has been done by J. J. Jakowsky at the U. S. Bureau of Mines in Pittsburgh. He has not only succeeded in cracking heavier hydrocarbon to make gasoline but also has succeeded in making carbon black from natural gas and a similar black from kerosene. This is as yet only a laboratory method, but with cheap electricity, it shows interesting commercial possibilities.

No Basic Cracking Processes

It is difficult for some of us to understand much of the discussion relative to the many alleged basic (I dislike the mere sound of this term, but here use it advisedly) differences between various cracking processes. As a matter of convenience, we may divide the various processes according to whether they operate upon the oil to be cracked in (1) the liquid phase or chiefly in (2) the vapor phase. Then as subdivisions we have each of these with catalysts of some sort and with steam or some fixed gas. Let us see, before going farther, just what we do to crack heavy oil. Suppose we start with gas oil, 30-36 gravity Baumé. All that is necessary to crack this oil is a high temperature; for example, we might drop the oil onto a red hot plate. In this way, however, we crack it too far if the plate is kept very hot and produce chiefly free carbon or coke, and fixed gases. If the temperature is not so high, we simply distill off most of the gas oil without change. When a break occurs in molecules of heavier oil, a number of products are formed. If the temperature is very high, and especially if the pressure is low, we may have left almost wholly carbon and hydrogen. At temperatures suitable for production of gasoline, say 725 to 950 deg. F., we may have the production of carbon and lower members of the paraffin series, but also the formation of unsaturated hydrocarbons such as ethylene and its homologues or higher members and at higher temperatures ring compounds such as benzol and toluol.

> Cracking petroleum distillates is, in theory at least, a simple matter: We merely crack the whip with a long chain of carbon and hydrogen atoms and snap off a few of the smaller groups. But how shall we go about it? One inventor provides us with a series of knives to cut the long chains of fuel oil into the more easily digested lengths found in gasoline. There have been many other processes just as impractical. The real advance has come about through the development of efficient chemical engineering equipment for the operation

Since with too high a temperature we get chiefly fixed gases and coke and at a lower temperature we simply distill off the oil, it seeems evident that there will be some intervening temperature at which we may increase the yield of the intermediate compounds (gasoline) we want. But how can we achieve such a temperature when the oil distills off before it is reached? Evidently by holding pressure upon the oil being heated. As is now well known, that is the procedure employed and by heating oil in a still or pipes, it produces the required pressure by simple regulation of the temperature just as with a suitable boiler steam of any required pressure can be generated by varying the temperature.

Whether one heats oil in a large still in order to crack it or in tubes as liquid, the process in general is the same. Even if the oil is jetted in so as to act in the vapor phase either alone or with steam or other gas or vapor, the process is not essentially different—in other words, oil is being held under suitable pressure so that sufficient heat may be applied to crack it. Plainly stated, that is the sum and substance of the situation.

Further, someone comes along and claims he has wonderful basic patents because his process operates at higher pressures to hold oil in liquid phase when cracking, say, kerosene distillate. It is, of course, well known that the Burton process is not a very good means for cracking kerosene distillate and simply for the reason that the temperature employed is sufficient to distill kerosene under the pressures employed. That being the case, does not the intelligence of anyone skilled in the art at once indicate what is necessary if you desire to crack kerosene distillate in the liquid phase? It would seem so. No great inventive ability would appear to be required—but merely operative skill—to attain the required temperature to crack the kerosene and the pressure necessary to hold the oil while being cracked. It is admitted that this may involve the development of an ingenious apparatus for carrying out the process and all due credit is willingly given, but as to process, no. It is submitted that so far as existing operative, so-called heat and pressure processes are concerned, there is only one, and besides that was invented years before there was any demand for gasoline. It is recognized, of course, that there are many valuable process modifications that are patentable and rightly so and credit is due the inventors thereof, but they are not basic or fundamental excepting in their limited scope. With these subsidiary or supplementary patents the above statements are not concerned. While I am aware that many will not agree, it is the writer's opinion that failure to recognize these two simple facts has led to many of the ills and controversies of the present-day cracking industry without in any adequate measure supplying compensation therefor.

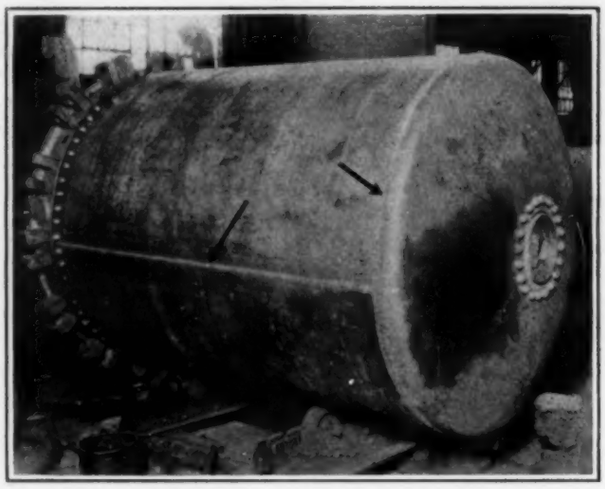
Without the shadow of a doubt, Dr. Burton and his co-workers deserve and have received enormous credit—not for the development of any wonderful process but for developing a wonderful equipment for carrying out a process that from any commonsense standpoint was not and is not patentable simply because of previous disclosures which made it public property. Such an interpretation would in no way have injured anyone and would have been of immense benefit to the industry in general. No one could have attempted to hold a monopoly of the industry, yet the first in the field would have had the advantage they were entitled to in that the equipment they developed was their own and it would have required years to develop new and patentably different equipment. The outcome of the pending government suit against many of the oil companies will hold considerable interest to the industry.

EDITOR'S NOTE: A second article by Dr. Brownlee, discussing the development of modern cracking equipment, will be published in a subsequent issue.

The Chemical Industry Is Getting
"Welding Wise"

THE process of electric arc welding is entering very largely into the production and repair of chemical apparatus. The chemical industry is getting "welding wise." The introduction of electric welding is having a pronounced effect on the fabrication of steel plate into pressure vessels, stills, retorts and all the great variety of containers used in chemical processes. This has been brought about by the need of manufacturers in these lines for cost-reducing methods. It has also been stimulated by the desire to make a better, smoother piece of apparatus, one easier to care for and presenting less opportunity for corrosion and deterioration.

The saving in the cost of manufacture is due largely to the lower cost of preparing the plates. Where electric welding is used, punching is saved, calking is not required, and the labor and overhead cost of the welding is far less than that of the riveting operation itself. The production of many pieces is simplified, as in the case of the vacuum drier here illustrated. The cumbersome lapping and flanging of plates is avoided, giving a smoother, finer vessel and one which by actual test has proved to be stronger and tighter than the corresponding riveted job.



Electric arc welding is used also to a great extent in repair work, such as patching of boilers, retorts, vessels, etc. With the electric arc a calking deposit of metal may be laid along the edge of a riveted seam, which increases its strength as well as making the joint tight and leak-proof. Patches can be welded in complete and corroded portions about the patch built up to original thickness.

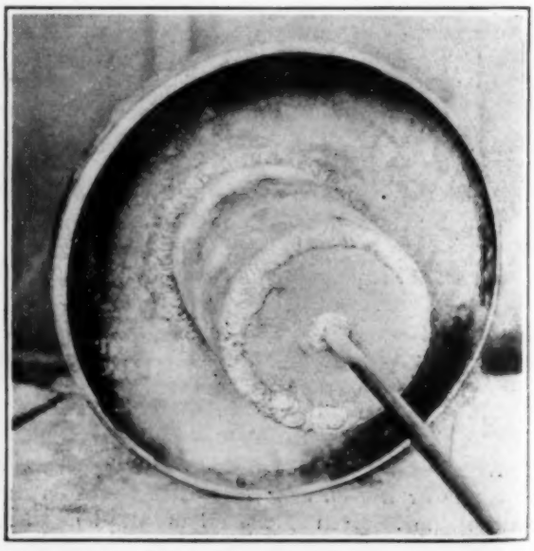
There has been a great amount of research work on this subject and a considerable amount of photographic material and cost data are available for study by those who may be interested in its application in chemical engineering industries.

Some Welding Achievements

(ABOVE) A vacuum drier of ¾-in. steel welded for 28-in. vacuum.

(ON EITHER SIDE) A section of cast-iron pipe repaired without dismantling by electric arc welding.

(BELOW) Ammonia condensers and receivers made by welding.



Is Osmium Poisonous?

The Answer Is Unanimously in the Affirmative—Here Are a Number of Don'ts for Those Who Handle It

IN THE last year occasional but increasing reference has been made to the production of osmium alloys for jewelry, and mention has been at times made of the poisonous qualities of the metal. As most textbooks on chemistry, if they make any mention of this rare element at all, generally call attention to the fact that there may be dangers incidental to its use, it seems as if some of the experience gained in refining and using osmium might be worthy of study and comparison.

In addition to a broad but unavoidably incomplete search for the sparse and scattered references to this subject in chemical and medical literature, recourse was also had, by interview and letter, to those who have been and are in charge of plants in which the platinum group of metals are refined or used, and to well-known chemists whose experience with these metals has resulted in broadening our knowledge of the chemical and physical behavior of this rare group.

The chief use of osmium is in the manufacture of fountain pens and in an alloy with iridium and gold. The osmiridium scales as they occur in nature are employed in tipping the pen points and an artificial alloy in which osmium is one of the components has been used with more or less success. All osmiridium grains are not suitable for tipping, as the size and hardness vary. It is very little used at present in connection with the hardening of platinum, although traces occur in the iridium employed for that purpose.

> **All authorities agree that any operations involving the use of this metal with heat are conducted safely only in a hood or room with sufficient draft to insure that the persons so employed may not be exposed to the fumes, and it is also recommended that a mask be worn to protect the face, throat and eyes; when large amounts of the metal are present under unfavorable conditions, it is also best to protect the otherwise exposed skin of the hands, wrists, etc.**

Osmium derivatives have been considered by various physicians as therapeutic agents and occasional references may be seen to their use in the treatment of skin diseases and neuralgia. They seem to be accompanied by effects not at all desirable.

Osmium oxidizes readily under certain conditions in air or in steam and it would be expected that in the oxy-hydrogen blowpipe, if an excess of oxygen were present, this tendency would be increased. The powdered metal begins to oxidize, as stated, at room temperatures and the oxide formed, osmium tetroxide, OsO_4, is very volatile. A refiner states that one of the employees was able to tell when a bottle containing the powdered metal was opened in a large room and that even a short exposure resulted in an irritated throat. The consensus seems to be that some persons are far more susceptible than others, although it is not known that any one is immune.

A Few Opinions

Dr. James Lewis Howe regards the remelting of osmium alloys as "decidedly dangerous, unless special precautions are taken to avoid the fumes, for the osmium oxidizes very readily at high temperatures," but he does not "think any other danger is to be apprehended in the use of these alloys except probably for anodes." (Private communication.)

The osmium tetroxide, which is the only one of apparent interest in this article, sublimes in white, crystalline masses or long, colorless, translucent, monoclinic needles and has a melting point of 40 deg. C. It boils at about 100 deg. C. Crookes speaks of "the noxious effects of osmic acid" and says in addition: "The deleterious action of this body (osmium tetroxide) upon the lungs has not been exaggerated and too much care cannot be taken to avoid inhaling it."

Schoeller and Powell have the following to say: "The vapor has a penetrating odor and it acts as a violent poison to the lungs and eyes. It is reduced to the metallic state in contact with the tissues and the metallic film thus deposited on the cornea produces permanent injury to the eyesight."

"The extraction of osmium from the alloy iridosmium is not only a very costly process but it is also a dangerous operation owing to the highly poisonous character of osmic acid vapor. With proper precautions the metal might be employed as a substitute for iridium in the hardening of platinum alloys, but the risk attending the handling at temperatures at which it will oxidize would appear likely to militate against its substitution for that purpose." (Imp. Resources Bureau, 1922; Platinum and Allied Metals, 1913-1919.)

In connection with the above, it is interesting to know that it is not considered a desirable constituent of platinum contact points, not because of any fear of injury to anyone but because of pitting of the surface, due no doubt to the oxidation of the osmium by the heat generated during the make and break of the current.

Friend (Vol. IX): "The vapors of osmium tetroxide are very penetrating and intensely poisonous, producing temporary blindness and other unpleasant symptoms." (See Deville and Debray, *Ann. Chim. Phys.*, 1859, pp. 56-385, and Sulc-Zeitsch, *Anorg. Chem.*, 1899, pp. 19-332.)

Baker & Co., the largest producers of refined platinum metals in the country, report that they have never had any case of permanent injury, but believed that, because the temporary effects are so painful, special precautions should be taken when working with osmium or its alloys.

L. E. Waterman & Co. who use comparatively large amounts in the making of fountain pens, report that the necessary precautions have been taken so that they have had no other than a few cases of slight and passing infection of the eyes.

One prominent refiner reports that a shipment of crowns from platinum rings, which were received as being platinum-iridium, contained as a matter of fact so much osmium that on melting the material the whole plant became filled with the fumes and it was necessary to shut down and send all the employees home, although no other than the temporary painful effects on the nose and throat were evident after a day or so.

Another refiner finds that when the goggles used are not carefully fitted or become old the vapor seeping through causes intense irritation of the eyes and that the face of the person working with the metal or its oxide becomes blackened so that the outline of the goggles or mask can be readily traced on the skin.

On the Engineer's Book Shelf

A General Introduction to Low-Temperature Carbonization

LOW-TEMPERATURE CARBONISATION. By *C. H. Lander* and *R. F. McKay*. New York: D. Van Nostrand Co., 1924. Price, $8.50 net.

Before proceeding to expend any great amount of time, energy and money on the development of a proposed invention, the wise inventor makes a study of the prior art. A knowledge of what others have done, their methods, mistakes and successes, is of the utmost importance to him. Such a knowledge, seasoned with judgment, is about the best safeguard against failure that the inventor can have.

This book on low-temperature carbonization of coal seems to be such a study of the prior art. The facts so far learned about this process are here set forth in brief, with many references to the literature on the subject that will enable the curious to consult the sources in detail. In addition, a sound basis for any study of the processing of coal is provided by several introductory chapters dealing with fuels in general, coal in particular, the chemistry involved in coal carbonization and the effect of heat on coal. The main part of the work deals with the technical side of low-temperature carbonization, the products obtained, some of the carbonization plants so far developed, some of the difficulties met with in operation and the estimated money returns from the process.

The most important service accomplished by this book is the gathering together of most of the facts ascertained about this "infant industry" to date. The new material presented is negligible, but much that was novel could not well be expected, for the periodical literature in this field has kept well abreast of progress. In fact, this literature has been so voluminous that a summary such as this book gives was needed. And the summary is so well given that a reading of it might well be regarded as a prerequisite to any connection with low-temperature carbonization.

However, in spite of this, the book should be taken by the American reader with the proverbial grain of salt. It was written by Englishmen for Englishmen, and while American experiments are mentioned, the fundamental differences between English and American coals and the necessarily different results that must be achieved in order to make a commercial success of the industry in this country are not considered.

For instance, the authors are rather optimistic about the successful operation of a paddle stirrer in a horizontal retort. Such a view is well enough in a country where non-caking coals are to be carbonized; but in the United States this is not often the case—high volatile, caking coals are the raw materials we must work with. With such materials, bitter experience has taught that no such stirring device is of practical utility.

Other points of this nature might be brought out, points wherein the book does not entirely jibe with American conditions, experience and necessities. But that does not detract from the value of the book in this reviewer's opinion. For it should not be considered as a textbook, but as an introduction to the subject and a review of past practice. From this angle it can be recommended as a useful volume.

G. L. MONTGOMERY.

But My Business Is Different

HANDBOOK ON ADVERTISING. By *S. Roland Hall*. 744 pages. McGraw-Hill Book Co., New York. Price, $5.

More than 150 years ago one Samuel Johnson (best known to us by the advertising he received from another man's book) wrote that he felt the art of advertising had progressed as far as possible. Little did he foresee that the one inch announcement of the arrival of a cargo of fresh Virginia tobacco and other items of equal interest would some day develop into a science—empirical, if you please—but a science nevertheless. While no university has as yet placed a period between the A and the D to signify the completion of a 7-year course, nevertheless today advertising is taking its place in the ranks with logic, ethics, philosophy and our other moral sciences, differing only in kind from our engineering sciences.

By advertising we refer to the publicity that helps to sell goods. True, advertising has been employed of late years to attain strange results. One concern wants to float a bond issue, so it buys a series of pages in a well-known weekly. A public utility corporation wishes to improve relations with its customers, so many pages are run taking the public into its confidence and revealing intimate business statistics. In fact the reviewer knows of one case where it is reputed that about $150,000 was spent to correct a heavy labor turnover. The employees were to be so proud of working for a company that could use full pages at $6,500 each that they'd never leave their jobs.

Next year we are told that Ford will spend $6,000,000 in advertising. Campbell Soup will spend more than a million and a half, and Colgate, Procter & Gamble, Congoleum and Victor (to name but a few of the many) will each spend over a million. The realization that successful businesses are spending these vast sums for advertising should make us want to know something more of the ways and means of this tremendous force.

On occasions too numerous to mention advertising men after hours of attempting to show how advertising might be used to help sell the product of the company in question are met with the answer, "All you say is true, but my business is different." Different the business may be, but that won't prevent the application of some of the fundamental rules of good advertising to help solve the question.

Now advertising, as generally thought of, has to do with advertising to the man in the street, the ultimate consumer, and we, on the other hand, are more inter-

ested in the advertising that moves goods from industry to industry. But there are many things that the general advertiser does that we can mold to our own needs.

You will find Hall's Handbook on Advertising will give you in convenient form these very fundamentals. The book is not intended specifically for the advertising specialist, but for the industrial official. It is not a compilation of untried theory, but is replete with examples of successful practice.

It is a book you'd like to have on your reference shelves.

Sands and Crushed Rocks

SANDS AND CRUSHED ROCKS. By *Alfred B. Searle*. Vol. I—Their Nature, Properties and Treatment. Vol. II—Their Uses in Industry. Oxford University Press, American Branch, New York. Price $17.50.

A technical book should serve at least one of two purposes, preferably both: as an encyclopedia of information on the subject and as a medium for the dissemination of details of recent progress. Pioneer work is usually strenuous; to follow a trail that has been blazed by another is a comparatively easy matter. The two volumes under review constitute the first serious effort to deal with the science and technology of sand and crushed rock. The result is indicative of the wealth of information that can be collected on a subject that a casual observer would consider treatable adequately in a monograph.

Earlier chapters in the first volume discuss in detail the origin, formation, occurrence, distribution, characteristics, constituents and properties of sands in immense variety. These are followed by a chapter on examination and testing, and by others on prospecting, mining and quarrying. Techno-industrial practice on crushing, grinding, purification and grading is elaborated, adequate attention being paid to washing, concentration, flotation, calcination and classification. These aspects of the work, as may be imagined, cover a big field; and the author is to be congratulated on the comprehensiveness of the treatment given. No one who is interested or concerned in the handling of sandy material in any form will fail to find suggestive information in this volume.

The second volume of the book discusses the uses of the various classes of sand in the making of ordinary and refractory brick, concrete, roadbeds, pottery, glass, abrasives, polishes and explosives. The value of sand in the agricultural, chemical and metallurgical industries is described in detail. In summary, it may be said that the book supplies a want that was realized by few. As a pioneer work it will serve as a foundation for a more intensive study of special problems and the co-ordination of data on details of the subject that, for lack of adequate and efficient media for publication, remains unchronicled. "Sands and Crushed Rocks" should find a place in every technical reference library.

A. W. ALLEN.

A Stimulus to Research

INTRODUCTION TO ORGANIC RESEARCH. By *E. Emmet Reid*, professor of organic chemistry, Johns Hopkins University. 343 pages. D. Van Nostrand Co., New York. Price, $5.

Although addressed specifically to organic chemists, there is much useful information of wide interest in this book. The field of research, literature and patent searches and the problem of writing up results are treated in a way that should prove most helpful. As an effort toward the encouragement of effective research the book is indeed noteworthy. Among the discussions that have been specially contributed are: patent searches, W. W. Ammen; plant processes from laboratory experiments, C. M. Stine, chemical director, E. I. du Pont de Nemours & Co.; study of reactions, F. O. Rice; synthesis of medicinals, A. D. Hirschfelder, M.D.

Oil Refinery Specifications

OIL REFINERY SPECIFICATIONS. By *A. L. Nugey*. 210 pages, illustrated. Chemical Publishing Co., Easton, Pa. Price, $3.50.

Based on personal experience, the author has compiled condensed specifications covering all phases of modern refinery practice. It is distinctly a practical book, containing the fundamental principles of refinery engineering and may well be expanded in subsequent editions to a comprehensive handbook on this subject.

A.S.M.E. Transactions Index

TRANSACTIONS INDEX, AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Vols. 1 to 45, 1880 to 1923. 222 pages. Published by the Society, New York. Price, $3.

Without a comprehensive index, data of incalculable value are likely to remain hidden in the mass of published papers that go to make up the transactions of a great society. The present work, covering the entire series, forms a guide not only to the papers themselves but to pertinent information contained in the discussions. The general style of Engineering Index has been followed, grouping all items alphabetically under authors' names and subjects in a single list.

Protecting the Worker's Eyes

EYE HAZARDS IN INDUSTRIAL OCCUPATIONS. By *Louis Resnick* and *Lewis H. Carris*. 247 pages, illustrated. National Committee for the Prevention of Blindness, Inc., New York. Price: paper with linen backing, $1.50; fabrikoid, $2.50.

There is hardly an industrial plant that could not profit from the application of the suggestions made in this book, for operations that present eye hazards are almost universal. Of particular interest to the chemical industries are the discussions of processes where protection from gases, fumes and liquids is required. Safety in handling caustic soda and acid carboys is considered in detail, together with first aid treatment for chemical burns. Regarding the use of goggles, some very striking and effective illustrations are given of instances where their use has saved eyesight. The study is a most important contribution toward the maintenance of better working conditions.

Research in Ferrous Metallurgy

JOURNAL OF THE IRON AND STEEL INSTITUTE, Vol. CIX, 1924. Edited by *George C. Lloyd*, secretary. 679 pages, illustrated. Published by the Institute, London; Spon & Chamberlain, New York.

CARNEGIE SCHOLARSHIP MEMOIRS, IRON AND STEEL INSTITUTE, Vol. XIII. Edited by *George C. Lloyd*, secretary. 294 pages, illustrated. Published by the Institute, London; Spon & Chamberlain, New York.

The latest volume of the *Journal* contains sixteen papers presented at the annual meeting, London, May,

1924, with discussions and correspondence. Section II contains, as usual, notes on progress of ferrous metallurgy as reported in society proceedings and in the technical press. The volume of memoirs contains nine papers covering: tungsten magnet steel; malleability of steel at high temperatures; fatigue; specific gravity of liquid iron; X-ray analysis of hardened steel; fatigue of casehardened parts; protection of iron with paint against subaqueous corrosion; specific volume of steels; slag-metal reactions.

Glimpses of Important Chemical Industries

CHEMISTS AND THEIR WORK. By *Stephen Miall*. 19 pages.
THE HEAVY CHEMICAL INDUSTRY. By *Rex Furness*. 28 pages.
FINE CHEMICALS. By *T. W. Jones*. 20 pages.
WOOD PRODUCTS. By *T. W. Jones*. 19 pages.
FERMENTATION INDUSTRIES. By *Rex Furness*. 19 pages.
CHEMISTRY IN THE MANUFACTURE OF PIGMENTS, PAINTS AND VARNISHES. By *C. A. Klein*. 24 pages.
THE QUEST FOR COLOUR. By *A. T. deMouilpied*. 30 pages.
CHEMISTRY IN RELATION TO FOOD. By *G. W. Monier-Williams*. 20 pages. All published by Ernest Benn, Ltd., London. Price, 6d. each.

An interesting style and non-technical method of presentation make these pamphlets a valuable addition to popular discussions of chemical industries. Unlike some of the efforts to popularize chemistry, the information is technically correct and the books will therefore also be of interest to the technical man as concise reviews of the present status of the industries treated.

A.S.T.M. Tentative Standards

A.S.T.M. TENTATIVE STANDARDS, 1924. 763 pages, illustrated. American Society for Testing Materials, Philadelphia, Pa. Price, $7 in paper, $8 in cloth binding.

The proposed standards in this book are printed with a view of eliciting criticism which will be carefully considered by the appropriate committee before recommending final action toward the adoption of the standard. The 185 tentative standards cover the following fields: Steel and wrought iron, non-ferrous metals, cement, lime, gypsum and clay products, preservative coatings, petroleum products and lubricants, road materials, coal and coke, timber, waterproofing, insulating materials, shipping containers, rubber products, textile materials, thermometers, miscellaneous.

Data on Commercially Important Minerals

THE MINERAL INDUSTRY: Its Statistics, Technology and Trade During 1923. Edited by *G. A. Rousch*, associate professor, department of metallurgy, Lehigh University. Vol. XXXII, 887 pages. McGraw-Hill Book Co., New York. Price, $12.

As a source of current information on mineral products this annual review continues to hold a most important position. In 46 chapters, many of which have been prepared by specialists, the metallic and non-metallic minerals of commerce from abrasives to zinc are treated with particular reference to developments during the year 1923.

Steinmetz the Man

CHARLES PROTEUS STEINMETZ. By *John W. Hammon*. 489 pages, 18 illustrations. Century Co., New York. Price, $4.

Although Dr. Steinmetz was almost constantly in the public eye, more popular myths seem to have surrounded him than any of his contemporaries. The author of this biography knew Dr. Steinmetz, his friends and fellow workers. Several of the chapters were finished before the great engineer's death and were subject to his review and approval; the remainder of the book was completed with the co-operation of his foster son, J. LeRoy Hayden, with whom he lived. As a result the book is the correct story of a great man and of a great career; not merely the history of a renowned engineer but of an eminently gentle and lovable personality.

International Fertilizer Statistics

PRODUCTION ET CONSOMMATION DES ENGRAIS CHIMIQUES DANS LE MONDE (Production and Consumption of Chemical Fertilizers in the World). Third edition, 266 pages plus 260 diagrams and 6 maps. Institut International d'Agriculture, Rome. Price, 25 francs.

The bulk of this volume is devoted to a tabular presentation of data on the consumption of fertilizers in the various countries of the world. These tables, more than 500 in number, are supplemented by about half as many graphs. Another chapter summarizes the replies to a questionnaire that was sent to the governments of the various countries covering the fertilizer situation during and since the war. Throughout the volume the statistics cover the years 1913 to 1922 inclusive, so that the data are up to date as well as comprehensive. It is of interest to note that an English edition is in preparation, although so much of the information is in the form of tables and graphs that it is not at all difficult to use.

Technology of Cocoa and Chocolate

DIE SCHOKOLADEN-FABRIKATION (The Manufacture of Chocolate). By *Dr. Paul Zipperer*. Fourth edition, revised and enlarged by Dr. H. Schaeffer and Dipl.-Ing. Schröder. 338 pages, 95 illustrations. M. Krayn, Berlin. Price, $5.

The encouraging development of the German chocolate industry since the war has prompted the preparation of this new edition of Zipperer's standard work on the subject. It covers the industry thoroughly from the raw cacao bean to the finished product. The first section considers the cacao tree, its geographical distribution, the preliminary treatment of the beans and their chemical characteristics. Nearly 140 pages are devoted to the technology of chocolate and cocoa. Sugar, spices, flavors and other materials added are treated separately, and a final section discusses such problems as testing and detection of adulteration.

Chemistry in the Laundry

MANUAL OF STANDARD PRACTICE FOR THE POWER-LAUNDRY WASHROOM. By the Department of Research of the Laundryowners National Association, at the Mellon Institute of Industrial Research. Second edition, 187 pages. Laundryowners National Association, La Salle, Ill.

As a result of the researches which furnished the data for this manual, the art of laundering has been placed on a scientific basis and it is now possible for the operator to consider his problems intelligently and solve them with the aid of information founded on scientific principles. The work is of general interest in showing what can be done in an industry that has in the past applied chemistry empirically and almost without any idea of the principles involved.

Equipment News

From Maker and User

Filters for Corrosives

For many years the manufacturer of the Sweetland Filter Press, the United Filters Corporation, Hazleton, Pa., has made special presses to order for service in handling liquids that are corrosive in action. The demand for these machines has grown to such an extent that this company has recently made a special study of filter presses for service with corrosive liquids and is now prepared to supply equipment for many special adaptations, including, in addition to the corrosive service mentioned above, such industries as food products manufacture, where contact with iron or steel would contaminate the product.

Because these special types of service are so varied, each problem requires special study before the material from which the press is to be made can be determined. Among the materials used for various applications are lead, copper, Monel metal, bronze, Everdur, aluminum and wood. Such materials are used only for parts coming into contact with the liquid, and other parts are usually of standard iron and steel construction such as is used in standard Sweetland filter presses. Of these the more commonly used, such as the lead-lined filter, have reached the stage of standardization where standard specifications are issued by the makers.

Many materials that are filtered do not attack cast iron, but decidedly attack steel and wrought iron. For most of such problems a Sweetland filter is built in which the leaves and outlet fittings are formed of a suitable resistant material, depending on the service required, and the interior of the cast-iron body is given a protective coating, such as Hamrick's Hard Shell Enamel or asphaltic paint.

Power Saver

A maximum demand regulator for reducing peaks and power demands on electric systems has been developed and placed on the market by Edward T. Moore, electrical engineer, Drawer 4, Syracuse, N. Y.

The device can be used to limit the amount of power taken by any current-consuming device and is especially adapted for use with large loads such as electric steel melting furnaces, annealing and heat-treating furnaces, and pulp wood grinders, as well as motors and other equipment.

The equipment is mounted in two pressed steel cabinets, each 14x11x4 in., is simple to install and requires practically no attention, yet is said to be absolutely reliable. Savings in installations to date are claimed to be of such magnitude as to pay for the cost of the regulator within 2 months. The device is guaranteed by the maker to function for the purposes intended.

The regulator may be set to limit any power load to a predetermined amount and may be used for any length of demand period, such as 1 minute, 5, 10, 15, 30 minutes or 1 hour and may be changed as desired. The method of measurement of the demand, either by a graphic meter or integrated meter, can be taken care of.

Vacuum Evaporator and Drum Drier Combined

A Device Wherein the Concentration and Drying of a Liquid Is Carried On Continuously in the Same Apparatus

Many substances dried in vacuum drum driers must first be concentrated—that is, the original moisture content is too great to be conveniently removed entirely in the drier. For such cases, where it has been customary to use a single effect evaporator as a pre-concentrator, a novel unit machine has recently been placed on the market by the Chemical & Vacuum Machinery Co., Inc., 1606 Main St., Buffalo, N. Y.

In this machine, illustrated in cross-section in Fig. 1 and assembled in Fig. 2, an evaporator is attached directly to the lower part of the casing of a vacuum drum drier in such a way that the inside of the tubes communicates directly with the drier chamber. The evaporator consists of tubes contained in a steam chest, the liquid to be concentrated being within the tubes and the steam outside. The upper end of the steam chest is attached to the lower side of the drier casing. A steam chest

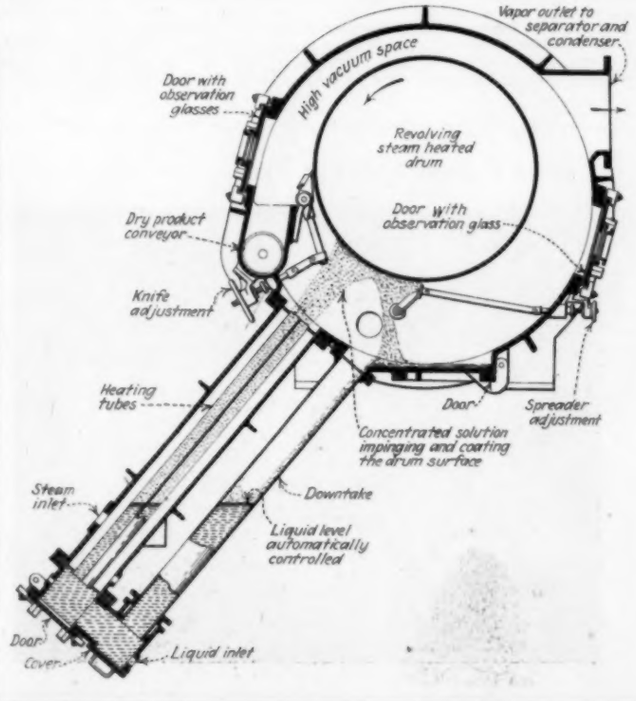


Fig. 1—Cross-Section of Combined Evaporator and Drier

The liquid level in the tubes is maintained automatically. Due to the formation and expansion of steam, the boiling liquid in the tubes is rapidly carried upward along the tube walls, part of the water content being vaporized meanwhile. The constant formation and increasing volume of steam increase this upward velocity, until at the upward end of the tubes the liquid has sufficient velocity to impinge with force against the drum and there deposit a film. The thickness of this film is regulated by a spreader. The surplus liquid returns by gravity to the reservoir and again makes the above-described circuit.

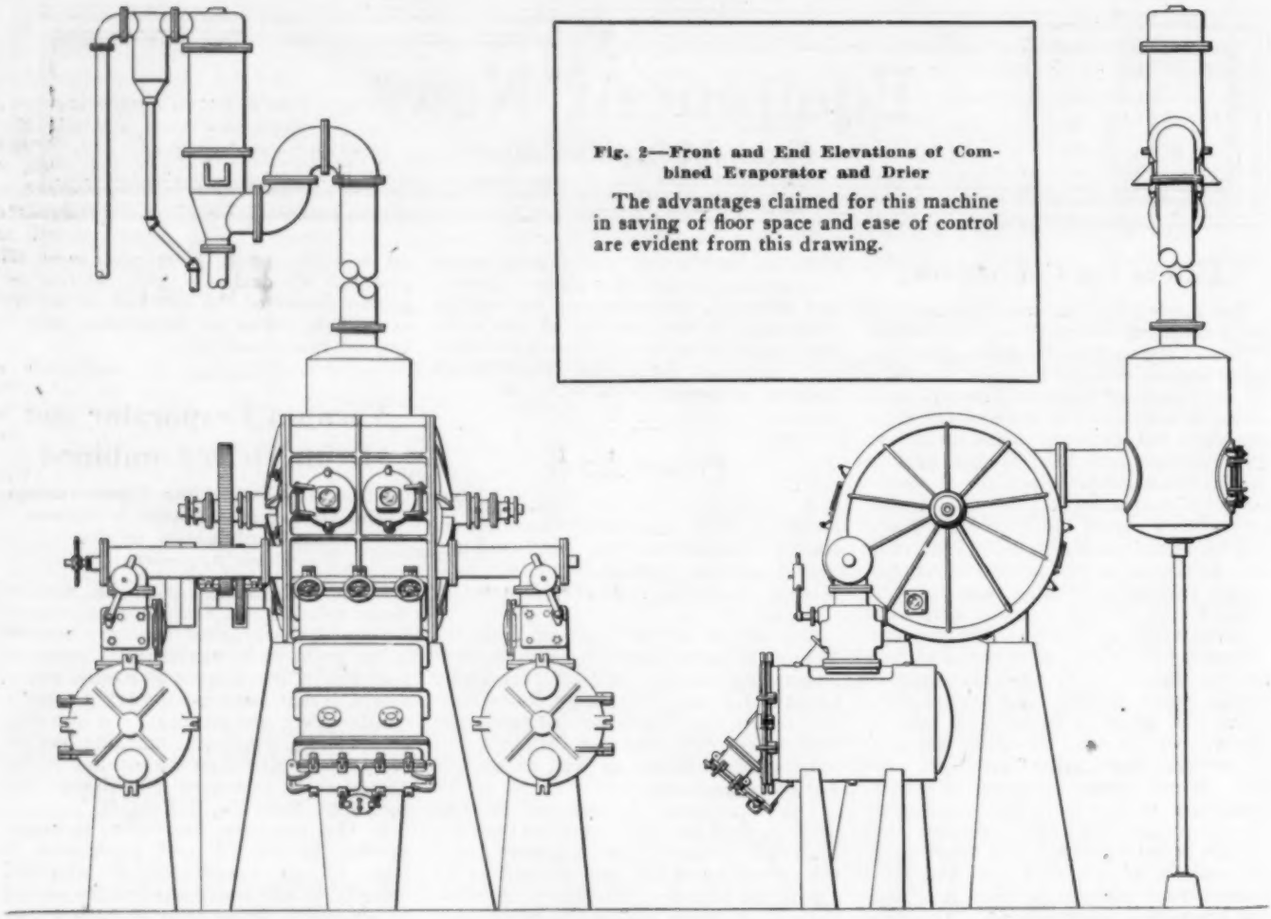


Fig. 2—Front and End Elevations of Combined Evaporator and Drier

The advantages claimed for this machine in saving of floor space and ease of control are evident from this drawing.

head, forming a liquid reservoir, is attached to the lower end of the steam chest and is provided with doors so that the lower ends of all tubes may be exposed. The steam chest is placed at an angle to the vertical to facilitate easy access to the interior of chest and tubes for cleaning. A downtake is provided for the return of excess liquid from the drier casing to the steam chest head.

Before starting operation, the liquid first entering the drier is concentrated by adding heat to the evaporator only. The proper concentration is quickly reached, the drum is then heated and drying started. During operation the liquid is then maintained at the proper concentration in the evaporator.

The liquid level in the tubes is maintained automatically. Due to the formation and expansion of steam, the boiling liquid in the tubes is rapidly carried upward along the tube walls, part of the water content being vaporized meanwhile. The constant formation and increasing volume of steam increase this upward velocity, until at the upward end of the tubes the liquid has sufficient velocity to impinge with real force against the drum and there deposit a film. The thickness of this film is regulated by a spreader. The surplus liquid returns by gravity to the reservoir. The apparatus may be used as an evaporator only if so desired.

Among the advantages claimed for this unit are the following: Elimination of a separate evaporator unit, elimination of an operator for evaporator, less space requirements, lower radiation losses, lower first cost, and no need for storage of concentrated liquid.

Manufacturers' Latest Publications

United Filters Corp., Hazleton, Pa.—Bulletin 108. A catalog describing a special type of acid-proof Sweetland filters used for handling chemical liquors, sludges, etc., containing corrosive agents which make it necessary to use filters constructed of corrosion-resisting materials.

Norton Co., Worcester, Mass. — The September, 1924, issue of the bulletin "Norton Floor," giving some interesting information on floors for industrial plants.

Metals Refining Co., Hammond, Ind.—A pamphlet entitled "Our Illustrated Sales Story Truly Told," a description of the plant and methods of this concern.

Industrial Products Co., 1001 Chestnut St., Philadelphia, Pa.—A leaflet describing the C. & E. universal safety handle for extension cords and drop lights.

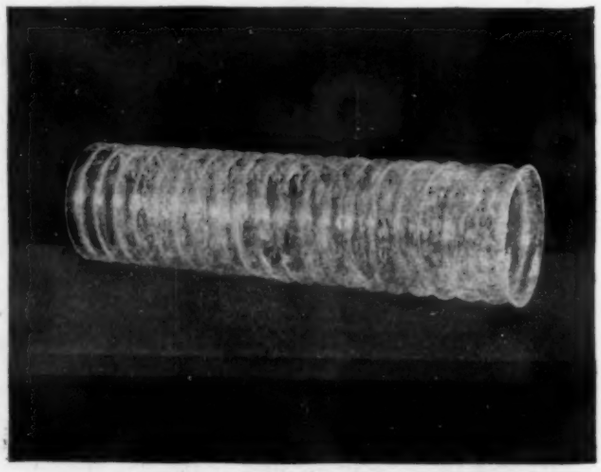
Ajax Electrothermic Corp., Trenton, N. J. —A new folder describing various types of high-frequency induction furnaces and their operation from the high-frequency converter.

Allen Ashley, 152 West 42nd St., New York—A bulletin describing second-hand turbines, generators and refrigeration equipment now available.

Crescent Refractories Co., Curwensville, Pa.—Series 1, No. 7. A leaflet discussing the theory and principles of combustion.

Large Fused Quartz Tube

The picture herewith is said to show the largest fused quartz tube ever made. The tube, which is 8 in. in diameter and 30 in. long, was made by The Thermal Syndicate, Ltd., 58 Schenectady Ave., Brooklyn, N. Y., in its works at Walls-end-on-Tyne, England, where the company has been making fused quartz for many years.



Important Articles in Current Technical Literature

"New Paper Mills." Descriptions of new mills at the following plants are given in the Oct. 30, 1924, issue of *Paper Trade Journal:* Riverside Fibre & Paper Co., Appleton, Wis.; Bogalusa Paper Co., Bogalusa, La.; Dunn Sulphite Paper Co., Port Huron, Mich.; E. B. Eddy Co., Hull, Que.; Pioneer Paper Co., Los Angeles, Calif., and several others on the Pacific coast.

"Artificial Sillimanite as a Refractory." By *Hewitt Wilson, Clarence E. Sims* and *F. W. Schroeder.* First part of a report on extensive studies of artificial sillimanite. *Journal American Ceramic Society,* November, 1924, pp. 842-855.

"What Has Been the Experience in Substituting Domestic Secondary and Primary Clays for English China Clays?" By *Karl Langenbeck.* An outline of the problem, with lengthy discussion covering results in plant practice. *Bulletin American Ceramic Society,* November, 1924, pp. 417-437.

"Some Thoughts on the British Dyestuff Industry." By *Dr. Herbert Levinstein.* A frank discussion of the situation by an eminent authority before the Society of Dyers and Colourists. *Chemistry & Industry,* Oct. 17, 1924, pp. 1029-1033.

"Technology of Crystallization." By *Hugh Griffiths.* Discussion of recent developments in mechanical methods of effecting and controlling crystallization. *Chemical Trade Journal and Chemical Engineer,* Oct. 24, 1924, pp. 486-488.

"Production of Chromium Salts From Chrome Ore in the United States." By *C. B. Kinney.* Describes the sources of chrome ore and the manufacture of sodium bichromate. *Journal American Leather Chemists Association,* October, 1924, pp. 579-587.

"Manufacture of Vanillin." By *Percy May.* A review of the methods that have been developed for the synthesis of this compound. *Perfumery and Essential Oil Record,* October, 1924, pp. 351-358.

"Electrolytic Theory of Corrosion." By *Wilder D. Bancroft.* A comprehensive report to the corrosion committee of the National Research Council. Reprinted from *Journal of Physical Chemistry,* August, 1924, pp. 785-871.

Industrial Notes

The Geometric Tool Co., New Haven, Conn., has sold to Arthur E. Bellis its entire interest in the Bellis Heat Treating Co. Mr. Bellis is president of the latter company. The offices of the Bellis Heat Treating Co. will be removed immediately to Branford, Conn. There a Lavite wire-annealing demonstration plant is being installed at the plant of the Atlantic Wire Co. W. E. Hitchcock of the latter company has been elected director and treasurer of the Bellis Heat Treating Co., succeeding James W. Hook, resigned. The Bellis Heat Treating Co. is the patentee and owner of Lavite, a salt bath process for annealing, hardening and tempering of carbon and high-speed steels and other metals.

The Newark Wire Cloth Co., Newark, N. J., has established a new branch office at 66 Hamilton St., Cambridge, Mass., with John G. Lorine in charge.

The Roller-Smith Co., 233 Broadway, New York City, announces the appointment of Charles R. Speaker, Evening Star Building, Washington, D. C., as its representative in the District of Columbia. Mr. Speaker will also handle the Roller-Smith Co.'s government business in the States of Maryland, Virginia, North Carolina and South Carolina.

The Combustion Engineering Corporation, Book Building, Detroit, Mich., announces that James Cleary, formerly manager of its Philadelphia office, will assume management of the Detroit and Cleveland territories, with headquarters in Detroit. Frank Henderson will continue in charge of the Cleveland office. Joseph Lappin, formerly in charge of the Detroit office, has been assigned to New York for special work.

The Austin Co. of California announces the removal of its San Francisco office to greatly enlarged quarters at 244 Kearny St. Recently the headquarters staff of the Austin Co. of California, at Los Angeles, moved into its new home at 777 East Washington St.

U. S. Patents Issued Oct. 28, 1924

Filtering and Drying Organic Arsenicals. Paul George Dohr, Yonkers, N. Y., assignor to Kober Chemical Co., Inc., Hastings-on-Hudson, N. Y.—1,512,909.

Method of and Apparatus for Sharply Bending Fiber Boards. Armin Elmendorf, Chicago, Ill.—1,512,916.

Process for the Preparation of Magnesium Carbonate. Anton Hambloch, Andernach, Germany.—1,512,924.

Rotary Pump. Oystein Jacobsen, Dayton, O., assignor to the Duriron Co., Inc., New York.—1,512,934.

Process for the Production of a Substance Resembling Ebonite. Heinrich Frerichs, Hamburg, Germany.—1,512,979.

Recovery of Nitrate From Caliche. Elias Anthon Cappelen Smith, New York, N. Y., assignor to Guggenheim Bros., New York.—1,513,014.

Gas or Air Reversing Valve. Carl Stenbol, Sault Ste. Marie, Ont., Canada.—1,513,015.

Process of Fumigating and Disinfecting. Walter S. Landis, Whitestone Landing, N. Y., and Guy H. Buchanan, Westfield, N. J., assignors to American Cyanamid Co., New York, N. Y.—1,513,051.

Process for the Manufacture of Intermediate Products and New Intermediate Products. Richard Tobler, Basel, Switzerland, assignor to Society of Chemical Industry in Basle, Basel, Switzerland.—1,513,074.

Phosphoric-Acid Recovery. Harry Williams Charlton, New York, N. Y., assignor to American Cyanamid Co., New York.—1,513,088.

Compound of Mercury and Process of Producing the Same. Lucas P. Kyrides, New York, N. Y., assignor to Parke, Davis & Co., Detroit, Mich.—1,513,115.

Apparatus for Production of Oxygen and Nitrogen. James G. Lafferty, Coraopolis, Pa.—1,513,116.

Process of Vulcanizing Rubber. Yasujuro Nikaido, Bay City, Mich., assignor to Michigan Chemical Co., Michigan.—1,513,122.

Method of Treating Asphalt. Andrew J. Rowland, Cincinnati, O.—1,513,133.

Method for the Dispersion of Gum Into Colloidal Substance. Harlan L. Trumbull and John B. Dickson, Akron, O., assignors to the B. F. Goodrich Co., New York.—1,513,139.

Removal of Phenols in Solvent-Recovery Process. Jean Henry Bregeat, Paris, France, assignor to Bregeat Corp. of America, Wilmington, Del.—1,513,152.

Recovery of Volatile Solvents and Other Materials From Gas Mixtures. Jean Bregeat, Paris, France.—1,513,153.

Adhesive Material. Roy H. Smith, St. Paul, and Ralph B. Beal, Minneapolis, Minn.—1,513,191.

Treatment of Vanadium Ores. Marvin J. Udy, Niagara Falls, N. Y., assignor, by mesne assignments, to Electro Metallurgical Co., New York, N. Y.—1,513,200.

Process for the Production and Recovery of Metals in Finely Divided Form. Walter A. Schmidt, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles.—1,513,280.

Therapeutic Product From Kelp. John W. Turrentine, Washington, D. C.—1,513,298.

Process and Apparatus for Concentrating Grape Juices. Emile Augustin Barbet, Paris, France.—1,513,305.

Method for Refining Lead. Edward Salomon Berglund, Djursholm, Sweden, assignor to Trollhattans Elektrothermiska Aktiebolag, Stockholm, Sweden.—1,513,307.

Moldab E Compositions and Method of Making the Same. Willard H. Kempton, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Co.—1,513,323.

Method of Making Butter From Sour Cream. Herbert W. Low, Oakland, Calif., assignor of one-half to Sena C. Williams, Oakland.—1,513,331.

Method of Sherardizing. Otho V. Stewart, Wilkinsburg, and Leon McCulloch, Pittsburgh, Pa., assignors to Westinghouse Electric & Manufacturing Co.—1,513,349.

Vapor Separator. James M. Wadsworth, Fort Worth, Tex.—1,513,354.

Process for Treating Pipe Lones. Artis C. Campbell, Tulsa, Okla.—1,513,371.

System and Apparatus for Refining Oil. Chauncy Blair Forward, Urbana, O.—1,513,384.

Mold. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls, N. Y.—1,513,435.

Waste-Heat Drier. Martin J. Lide, Birmingham, Ala.—1,513,465.

Sintering Machine. Richard Lewis Lloyd, New York, N. Y., assignor to Dwight & Lloyd Sintering Co., Inc., New York.—1,513,466.

Drier. Elwood B. Ayres and Alpheus O. Hurxthal, Philadelphia, Pa., assignors to Proctor & Schwartz, Inc., Philadelphia, Pa.—1,513,474.

Method of and Apparatus for Determining Ion Concentration. Henry C. Parker, Philadelphia, Pa.—1,513,558.

Alumina Coagulant. Hugh McCurdy Spencer, Newark, N. J., assignor to Seydel Chemical Co., N. J.—1,513,566.

Process of and Apparatus for Extracting Oil. Abram S. Kirshner, Philadelphia, Pa., assignor of one-third to Samuel M. Kirshner, Philadelphia, Pa.—1,513,603.

Dry-Powder Jelly Base Containing Pectin. Herbert T. Leo, St. Joseph, Mo., assignor to Hazel Mary Leo, Topeka, Kan.—1,513,615.

Tile and Kindred Material and Method of Making the Same. John C. MacIldowie, Nashua, N. H., assignor to Asbestos Shingle Co., Nashua, N. H.—1,513,620.

Apparatus for Revivifying Purifying Materials. Fred W. Manning, Brooklyn, N. Y., assignor to Manning Refining Equipment Corp.—1,513,622.

Drier. Walter M. Schwartz, Philadelphia, Pa., assignor to Proctor & Schwartz, Philadelphia.—1,513,639.

Purifying Liquids by Filtering Through Chrome Leather. Albert Louis Benoit, Oisterwijk, Netherlands.—1,513,690.

Manufacture of Gold Leaf. Friedrich Demel, Twickenham, England, assignor of one-half to Richard Tindall Leighton, Hove, Sussex, England.—1,513,696.

Drying-Control Apparatus. Arthur E. Krick, Indianapolis, Ind., assignor to the Humidity Control Co., Indianapolis.—1,513,727.

News of the Industry

Summary of the Week

National Research Council is forming a committee to develop the chemistry of petroleum.

Government chemists do not favor arbitrary withdrawal of tetra-ethyl-lead gasoline from the market.

Uncertainty is increasing regarding administration of Dawes plan to delivery of German chemicals, dyes, and pharmaceuticals.

In connection with the nitrite of soda tariff case, counsel for importers has been granted permission to file a brief as amicus curiæ.

The Bureau of Entomology estimates that half a million pounds of paradichlorbenzene will be needed for peach borer control in Georgia.

Experiments with titanium chloride have demonstrated its value in the creation of smoke screens.

According to census figures sulphuric acid production by fertilizer manufacturers amounted to 797,174 tons in the first half of this year.

Operators of gas wells are urged to determine whether or not the gas has content of helium.

Government Chemists Defend Tetra-Ethyl-Lead Gasoline

Say Many Chemicals of More Dangerous Possibilities Are Being Handled in a Commercial Way

THERE is no support among government chemists in Washington for the arbitrary withdrawal of tetra-ethyl-lead gasoline from the market. There is some difference of opinion as to the source of the distressing physiological effects that have been manifested among those engaged in the preparation of the lead product, but there seems to be unanimity of opinion that many chemicals of much more dangerous possibilities are being handled continually in commercial channels. It also is agreed that once the tetra-ethyl-lead is mixed with the gasoline it has practically no possibility of being harmful. If the fumes from this type of gasoline were confined, it would be the carbon monoxide rather than any product of lead that would cause the damage. This point has been proved beyond question by the experiments at the Bureau of Mines. It was found that animals confined in a chamber were not affected by the exhaust fumes when carbon monoxide was filtered out. These experiments took due note of the cumulative properties of lead, but animals subjected to such an exhaust at regular periods for a number of months showed no signs of lead poisoning.

General Fries and the chemists of the Chemical Warfare Service are convinced that it is lead poisoning which has afflicted some of those engaged in the manufacture of tetra-ethyl-lead. Other competent chemists suggest the possibility that the toxicity may come from other substances formed during the manufacturing process. One chemist has pyridine under suspicion.

Some idea of the extent to which gasoline treated with tetra-ethyl-lead is being used is evidenced by the fact that it constitutes one-fourth of Washington's gasoline consumption, despite its having become available only 5 months ago. Gasoline thus improved is expected to lead to a redesign of internal combustion engines, with the practical certainty that greatly increased quantities of lead will have to be handled.

Demand for Bromine

In that connection much interest is being displayed here in the necessity for finding increased supplies of bromine to use in connection with this development. The prospective demand for bromine already greatly exceeds domestic production. While some opportunity is thought to exist in Michigan and Ohio to increase the output by the sinking of new wells, it is evident that other sources of supply must be called upon heavily. The Department of Commerce is making inquiry as to the possibilities of German production. The manufacturers are understood to have completed arrangements for an expedition to Palestine to investigate the possibilities of production there. It is known that the bromine content of the Dead Sea is high. No information is available, however, as to the geology of the Dead Sea basin, which is regarded as a favorable site for bromine deposits.

Other chemists in Washington see no substitute for bromination in the manufacture of tetra-ethyl. Chlorination has been tried, but lead chloride will not stand the temperature and the moisture content of the internal combustion engine cylinder.

Developments at Bayway

The principal developments of the week following the deaths at Bayway, N. J., of five employees of the Standard Oil Co.'s experimental plant for the production of tetra-ethyl-lead consist of the company's voluntary withdrawal of the ethyl gasoline from sale in New Jersey and the announcement by the local prosecutor that the case would be taken before the present grand jury at Elizabeth, N. J.

In its statement the company refers to the confusion in the mind of the public between the accident in the production of the concentrated tetra-ethyl-lead and the use of the greatly diluted product in ethyl gasoline. While the Bureau of Mines has investigated the latter phase of the subject and declared the danger exceedingly remote, the company at the request of the various health authorities has suspended further distribution in the State of New Jersey pending the completion of the studies at the Bureau of Mines and in the department of industrial hygiene of Columbia University.

State Labor Commissioner McBride after an investigation of the Bayway plant is reported to have said that the Standard Oil Co. had complied with all of the state laws regarding ventilation and healthful working conditions.

A Wilmington newspaper account states that during the past year nine men at the Deep Water, N. J., plant of the du Pont company lost their lives during development stages in the manufacture of tetra-ethyl-lead. It is believed that the new factory which will go into operation shortly after the first of the year has been so constructed as to reduce the danger of poisoning to a minimum.

Chemical Phases of Dawes Plan Favor Germany

It is becoming increasingly apparent that the Germans got the better of the representatives of the allied governments in the chemical phases of the Dawes plan. Information from abroad is to the effect that the allied interests conducted the entire conference at London without the advice of chemical specialists. The inference is that the industry in no one of the allied countries or in the United States had the foresight to have specialists on the ground. Had they been present and proffered their services, there is every reason to believe that they would have been consulted with regard to the chemical phases of the agreement.

It is understood that the German delegates and experts were greatly surprised at the apparent lack of attention given the chemical phases of the agreement. Apparently they took full advantage of that weak spot and there is great uncertainty as to just how that portion of the Dawes plan is going to be administered. It provides that the conditions of the Versailles treaty with regard to dyestuffs, chemicals and pharmaceuticals are to remain in effect until Dec. 31. However, with the beginning of the new year the German manufacturers no longer will be required to furnish monthly statements regarding production and prices. Instead the quantities of chemicals to be demanded during the remaining 3 years, 7 months and 15 days (the remainder of the time fixed during which these reparations may be called for) are to be contracted for with due regard to (1) the possibilities of production in Germany, (2) other phases of the economic situation, and (3) "ordinary commercial conditions."

It is true that provision is made for an arbitral commission, but the fear is expressed that the Germans will be able to take advantage of the vague and indefinite terms in which the chemical phase of the agreement is drawn and conceal or misguide the allies in connection with chemical reparation payments.

In the matter of pharmaceutical products the Germans obtained a concession from the allies' delegates that they are not to insist upon single concerns furnishing their products under the stipulations of the agreement. It now is realized that most of the important pharmaceutical products come from single concerns.

Agricultural Chemists Elect

Officers elected at the recent meeting of the Association of Official Agricultural Chemists were: Dr. C. A. Browne, chief, Bureau of Chemistry, president; H. D. Haskins, Amherst, Mass., vice-president; Dr. W. W. Skinner, assistant chief, Bureau of Chemistry, secretary-treasurer. The new members of the executive committee are Dr. W. W. Randall of Baltimore and Dr. W. H. MacIntire of Knoxville. New members of the committee on recommendations of referees are H. A. Leppar, Dr. E. M. Bailey and Dr. A. G. McCall.

Importers to Test the Legality of the Flexible Tariff

Will Enter Into Sodium Nitrite Case to Test Constitutionality of Flexible Tariff Provisions

A NEW ANGLE of attack against the flexible provisions of the 1922 tariff act developed in the District of Columbia Court of Appeals Nov. 3, when attorneys for the National Council of American Traders and Importers, Inc., were granted permission to file a brief as amicus curiæ in the case of the Norwegian Nitrogen Products Co. against the Tariff Commission.

The court granted 10 days in which to file the brief, after which 10 days probably will be granted for answers to this brief, so that the case probably will be reached in December.

There was no direct opposition to the motion to file a brief as friend of the court, which was presented by Charles F. Kinsley of New York and Melville Church of Washington as attorneys for the council, although District Attorney Peyton Gordon, representing the Tariff Commission, pointed out to the court that there was no issue of constitutionality before it in the record.

The brief of the National Council, it is understood, will vigorously contest the constitutionality of the flexible tariff provisions, and also will present arguments regarding the rights of parties at interest in cases before the Tariff Commission.

The case is before the Court of Appeals on appeal of the Norwegian Nitrogen Products Co., representing sodium nitrite producers of Norway, from an adverse decision of the lower court in a mandamus suit against the Tariff Commission to compel it to disclose costs of production of domestic manufacturers of sodium nitrite gathered in the course of an investigation under the flexible tariff which resulted in a proclamation by the President increasing the duty on this chemical 50 per cent above the rate named in the tariff act. The lower court held with the Tariff Commission that information in individual cases, including various specified items of costs of production, was confidential.

Constitutionality Plea Barred by Lower Court

In the lower court, Judge Marion DeVries, representing the Norwegian company, attempted to raise the constitutional question of validity of the flexible tariff, although he contended that the provision is constitutional. The Tariff Commission ignored the constitutional question. The same situation exists so far as the record goes in the Court of Appeals. The National Council of American Importers and Traders seeks to join this issue by a brief as amicus curiæ by contending that the provision is unconstitutional in that it is in effect a delegation of tax-raising powers which the Constitution gives to Congress alone.

When the Court of Appeals takes up the case for consideration, it first will pass on a motion by the Tariff Commission to dismiss the appeal as moot, because since the original proceedings were instituted the President has acted and increased the duty on sodium nitrite. To this motion, counsel for the Norwegian company has replied, pointing out that the flexible tariff empowers the President again to change a rate of duty whenever conditions change, and asking that the sodium nitrite case be reopened by the commission.

Alabama Fixes Gas-Heating Value Requirements

New heating value standards were formally adopted by the Alabama Public Service Commission in an order of Oct. 10. This order provides that each gas company in the state shall select its own standard of heating value, which standard must comply with two conditions: "(1) It shall be consistent with good service; (2) it shall be that value which the utility from its experience determines is the most practicable and economical to manufacture and supply to its customers."

It is also provided that the B.t.u. standard adopted by any company shall be made a part of the official schedule of rates filed with the commission. Thus the utility companies of the state are officially made to recognize the coordinate importance of heating value and price.

The new provisions in Alabama conform with the recommendations of the American Gas Association, which has urged that each community should be served with gas made according to a standard best suited to local conditions. The provisions are regarded by the association as an important step forward in supporting its proposal. The industries of Alabama also will undoubtedly cordially support the new idea, provided effective compliance can be had with the provision that the heating value must be the one which "experience determines is the most practicable and economical to manufacture and supply."

Pennsylvania Salt Mfg. Co. Buys Michigan Electrochemical Co.

The Pennsylvania Salt Manufacturing Co. announces the purchase of the capital stock of the Michigan Electrochemical Co. at Menominee, Mich. The plant, while not one of the largest in the country, occupies a strategic position and the products are identical with those made by the plants of the Pennsylvania Salt Manufacturing Co.

At a special meeting of the board of the Michigan Electrochemical Co. held Friday, Oct. 31, the former directors resigned and were replaced by the officers and directors of the Pennsylvania Salt Manufacturing Co.

Washington News

Operators of Gas Wells Urged to Test for Helium

For reasons of personal interest, as well as for the benefit of the public, every operator of gas wells in the country should establish whether or not helium occurs in any well under his supervision. Dr. S. C. Lind, the chief chemist of the Bureau of Mines, states that the point has been reached where helium has a very considerable potential value. The leasing act reserves to the government the helium occurring in gas from public lands, but on private lands it is the property of the owner and promises to become infinitely more valuable than the gas which contains it. The use of airships of the Zeppelin type for commercial purposes is likely to be undertaken in the near future, at which time there will be an immediate market for helium.

Titanium Tetrachloride Used to Create Smoke Screens

Experiments by the Chemical Warfare Service with titanium tetrachloride have demonstrated its exceptional value in the creation of smoke screens. An apparatus has been developed for sprinkling this compound from airplanes. It hydrolizes rapidly and produces a perfect screen of smoke. By regulating the sprinkling device the curtain can be made dense or thin. Each drop of the liquid forms a streamer of smoke as it falls. If the drops are small, the screen may be held at any height above the surface of land or water, but if it should be desired to maintain a heavy curtain for some time, the drops can be made so large that they will reach the ground and there continue to emanate smoke. Phosphorus, however, will continue to be the material used for smoke screens when great obscuring power and continuity of the curtain are required.

In that connection it may be stated that the Chemical Warfare Service is finding increasing use for phosphorus. It is regarded as one of the most useful of all of the materials being used in the development of chemical warfare substances. Phosphorus shells have been shown to be the most effective missile used against personnel.

To Collect and Centralize Data on Laboratory Equipment

In setting up a committee on construction and equipment of chemical laboratories, the National Research Council hopes to centralize in Washington complete data on the subject and to keep closely abreast with all laboratory developments, so that those about to install laboratories may be in a position to acquaint themselves with the last word in the progress of such construction. Instead of having to go to large expense for travel to inspect numerous laboratories, those contemplating such construction will be able to get all available information at the headquarters of the National Research Council when the objective of the new committee is attained. Complete information will be made available as to all types of laboratories from that needed for the small high school to the largest of laboratories for industrial research. The chairman of the new committee is the Rev. George L. Coyle, of Georgetown University. The committee will have the advantage of the data which now are being collected at great expense by Georgetown University preparatory to the installation of a large chemical laboratory there, which is to be under the direction of Father Coyle.

Twelfth Supplemental List of Dye Standards

The Treasury Department has issued its twelfth supplemental list of standards of strength of coal-tar dyes. This list enumerates seven additional dyes and names fourteen others for similitude, and makes two corrections in previous lists. The lists are used in assessing the specific duty of 7 cents per pound on dyes, which is applied in the ratio that the strength of the importation bears to the strength of commercial imports of similar dyes prior to July 1, 1914, when nearly all dyes were imported in lower concentrations than now.

Computation of Fertilizers Simplified by Formulas

How to compute the amounts of various inorganic materials used in fertilizer mixtures is described in a new publication just issued by the Department of Agriculture as Department Bulletin 1280. A system has been devised which by means of triangle diagrams saves much arithmetical work in computation.

American Clays Equal Foreign for Paper Making

That American clays compare favorably with foreign clays as fillers in making paper is the conclusion drawn from an investigation of clays for this purpose made at the Bureau of Standards. The amount of clay retained in the paper, and in general the quality of the paper, were found to be the same for both American and foreign clays. A slight advantage for the foreign clays was shown by the color and grit tests, but the bureau does not consider it sufficient to justify the consideration of only these properties in selecting clays.

Most of the tests were made in the experimental paper mill at the Bureau of Standards, although duplicate tests of part of the work were made in a commercial mill. Eight representative clays were used, and the study included a comparison of the amount of clay retained in the finished paper, the quality of the paper produced and those properties of the clay, such as grit, that might affect the paper-manufacturing process. Good agreement was found between the results in the experimental mill and those in the commercial mill.

Clays have long been used as fillers in making paper, their purpose being to increase its opaqueness and to improve the printing quality of the surface. Paper makers in general have favored clays from foreign sources, believing that American clays produced inferior paper. The present investigation was made with a view to ascertaining whether or not this belief is true.

Improvement in the Italian Tanning Industry

The Italian tanneries were hard hit by the post-war crisis and have since been working at far below their capacity owing to inability to meet competition, especially from Germany, according to Commercial Attaché McLean, at Rome. Several appeals have been made to the government for assistance in the shape of higher duties or restrictions on the exportation of hides, which, it was said, were being exported to the detriment of the local industry. However, recently there have been indications of improved conditions and the Federation of Italian Tanners Associations now reports that in spite of the normal dullness that prevails during the summer months the activity of the plants and the commercial movement have been unusually brisk. This is especially true of chrome upper leather, and even in the case of sole leather, which is always less active, there has been an export demand for the better qualities. The shoe factories are working regularly and as they have a moderate volume of advance orders for the new season on hand the outlook for the future is favorable.

Sulphuric Acid Production in First Half of Year

The Department of Commerce announces that, according to data collected by the Bureau of the Census, fertilizer manufacturers during the first half of 1924 produced 797,174 tons of sulphuric acid and consumed 886,901 tons in the manufacture of 1,584.195 tons of acid phosphates containing 26,547,810 units (20 lb.) of available phosphoric acid. The production of sulphuric acid by fertilizer manufacturers was thus equal to 90 per cent of their total consumption. Acid phosphates sold as such amounted to 1,310,678 tons, containing 21,555,342 units of available phosphoric acid; and 1,261,190 tons, containing 20,288,788 units, was consumed in the manufacture of other fertilizers.

The statistics for the first half of 1924 as compared with the first half of 1923 show an increase of 15.3 per cent in total sales of acid phosphates, together with decreases of 9.9 per cent in production of acid phosphates, 4.5 per cent in stocks of sulphuric acid on hand at the end of the period and 13.1 per cent in stock of acid phosphates.

News in Brief

Canadian Feldspar Company to Erect Plant at Ogdensburg—The International Feldspar Co., Ltd., Buckingham, Que., Canada, manufacturer and distributor of feldspar and quartz products, has acquired a tract of land in the west end of Ogdensburg, N. Y., upon which it is planned to erect a modern branch plant to supply the United States trade.

Small Sales of German Potash in First Half of Year—Consul-General Dumont in a report from Frankfort-on-Main states that present conditions indicate that the current year will be the worst in the German potash industry for many years. The syndicate's sales of pure potash for the first 6 months of 1924 are estimated at 3,270 metric tons, compared with 5,587.2 during the same period in 1923 and 6,801.4 in 1922.

Large Output of Brick in Saskatchewan—More than 3,000,000 face and fire brick and 750,000 hard-burned vitrified brick for roundhouse work for the Canadian National Railways have been manufactured at Claybank, Sask., this year, according to T. M. Molloy, commissioner of the Bureau of Labor and Industries, who has made a tour of inspection of clay deposits in southern Saskatchewan in company with Dr. Charles Camsell, deputy minister of the federal Department of Mines, and A. J. C. Nettell, of Vancouver, British Columbia representative of the Geological Survey.

Canadian Exports of Pulp and Paper Increase in September—Exports of Canadian pulp and paper during the month of September were higher than those of the preceding month, the total combined shipments being valued at $11,656,466, the betterment being $751,046. This, however, was a decrease of $59,403 when compared with September of last year. Exports of paper alone showed a considerable increase over September of last year, being $8,142,660, as against $7,564,251. Exports of pulp were $3,513,806, as compared with $4,151,618 during the corresponding month last year. Exports of pulpwood amounted to 96,535 cords, valued at $1,057,410, as compared with 104,794 cords, valued at $1,173,995, in September last year.

Du Pont Chemists Produce New Panel—Chemists of the du Pont company have developed a new radio panel which revealed unusual qualities under tests. Recent experiments conducted at the Cruft high tension laboratory of Harvard University, to which the panels were submitted, show that the new material, submerged in water for 6 hours, absorbed less than 0.03 per cent. Owing to this minimum amount of absorption of water, the electrical constants remain practically unchanged under varying atmospheric conditions. The tests at this laboratory were continued over a period of 6 weeks. The new panel, which is known as pyradiolin, has the further advantage that it can be handled by the amateur builder as easily as a piece of soft pine. It will not chip, crack, warp or shrink and is extremely easy to cut, saw, drill, engrave and stamp.

New Trade Commissioner to Berlin—The appointment of Theodore Pilger of Butte, Montana, as Trade Commissioner to Berlin, Germany, was announced last week, by Dr. Julius Klein, Director of the Bureau of Foreign and Domestic Commerce. A graduate of the Montana School of Mines, Mr. Pilger has had an extensive and varied career as a mining and mechanical engineer, sales engineer and geologist. As a member of the Commercial Attache's staff at Berlin, he will devote his attention particularly to the metallurgical situation, and will follow closely the developments in the German machinery and agricultural implements, electrical apparatus industries and allied trades.

New Type of Electric Furnace Used in North Carolina—Through work of the Engineering Experiment Station at the North Carolina State College investigating the minerals of North Carolina it is possible that a new invention has been developed in a new double electric furnace which has indicated substantial gains and efficiencies. This furnace uses alternating current for heating the fused electrolyte and direct current for its electrolysis.

Committee on Chemical Education—Through the authorization of the executive committee of the Chemical Society of Washington, R. S. McBride, president of the society, has appointed a committee on chemical education to prepare a recommendation regarding the best procedure to organize the chemical teachers of Washington and vicinity; to discuss such plan with the executive committee and the local section of the American Chemical Society on November 13, the annual meeting of the Society; and to take proper steps to put the approved plan into effect. Following are the members appointed as the committee: L. W. Mattern, McKinley High School, Chairman; James F. Norris, National Research Council; Charles E. Monroe, Bureau of Mines; G. L. Coyle, Georgetown University; Miss Elizabeth R. Gatch, Central High School; N. E. Gordon, University of Maryland; Frank Suter, Eastern High School.

French Interests to Manufacture Zinc Oxide in Mexico—A report from M. B. Davis, Consul at Saltillo, states that a company owned by French interests is planning to manufacture zinc oxide for direct sale to distributors and large consumers in Mexico, exporting the remainder. It is expected that the installation will be completed about Jan. 1, 1925. The report also states that mixed zinc and lead sulphides are being shipped by one Mexican company to its parent concerns in Belgium without treatment of any kind. A calcinating plant under construction in Saltillo was expected to be ready about Nov. 1, 1924, when this company was to begin to ship calamine. Manufacture of zinc oxide is not contemplated.

French Import and Export Trade in Chemicals

The following figures give details of import and export trade of many chemical products which entered or were shipped out of France in the first 8 months of the year. Comparison also is given for the corresponding period of 1923. The figures represent metric quintals:

	1924	1923
Imports		
Sulphate of ammonia	792,279	482,794
Borax	53,535	47,902
Chromate and bichromate of potash and soda	28,801	24,609
Sulphate of copper	203,572	199,341
Carbonate of potash	22,991	22,245
Oxide of zinc	37,704	36,434
Lithopone	73,868	55,261
Heavy oils	132,717	99,571
Benzols (combustible)	151,913	194,894
Benzols (industrial)	164,271	98,692
Acetone	4,776	6,934
Celluloid	1,752	1,240
Mineral superphosphates	180,213	363,486
Nitrate of soda and cyanamide of lime	158,911	163,406
Exports		
Acid sulphuric	291,163	159,286
Alumina anhydrate	168,970	106,227
Sulphate of copper	79,779	86,921
Sulphate of ammonia	9,222	2,620
Calcium carbide	73,444	69,344
Cyanide of sodium	8,995	13,516
Sulphate of magnesia, potash and kainite	203,551	148,842
Sylvanite, etc.	3,613,098	3,445,648
Chlorate of potash	310,156	158,756
Chlorate sodium	229,634	219,242
Caustic soda	227,054	185,421
Sulphate of soda	118,149	157,762
Glycerine	35,053	35,224
Tartrates	62,412	76,473
Aniline	7,459	6,350
Celluloid	3,378	2,597
Mineral superphosphates	1,292,097	678,316
Basic slag	3,133,024	1,558,445

Accumulations of Indigo in Chinese Markets

In a report from Shanghai, trade commissioner G. C. Howard says that arrivals of indigo have been normal and resulted in the accumulation of about four months supply, due to adverse factors affecting sales. Floods in many sections of China reduced buying considerably, but did not severely affect trade, as they occurred during the season when most of the dye plants were closed. War in the Chekiang and Kiangsu has stopped business in these provinces and seriously affected the clearances for inland points, while rumors of impending war between Peking and Manchuria forces affected a slowing up of trade throughout northern and central China. Prices on brands, including all American indigo, averaged for the whole of China approximately 40 taels per picul during September. Well-known German brands were bringing 48 to 50 taels. Imports of synthetic indigo through Shanghai for June, July, and August were approximately 65 per cent German, 25 per cent American, and 10 per cent Swiss origin.

Outlet for Paradichlorbenzene

Half a million pounds of paradichlorbenzene for peach borer control will be needed in the Georgia peach belt, the Bureau of Entomology estimates.

Trade Notes

E. V. Peters, general sales manager of the New Jersey Zinc Co. and newly elected president of the National Paint, Oil and Varnish Association, sailed for Europe on Nov. 5 and will remain abroad about 6 weeks.

W. & J. Sloane of New York have bought 82 acres of land near Trenton, N. J., as a site for a linoleum plant.

E. H. Manahan, who has been identified with the chemical business for many years, has resigned his position with Eugene Suter & Co., of New York. Mr. Manahan had acted as vice-president and manager of the chemical department for the latter concern.

The Isaac Winkler & Bro. Co. of Cincinnati, Ohio, has filed certificate of statement and designation with the Secretary of State at Albany.

Gloss Products, Ltd., has been incorporated in Calgary, Alta., Canada, to manufacture and deal in all kinds of polishes for use on furniture, automobiles and surfaces of every kind. The new company is capitalized at $75,000.

John Lucas & Co., Inc., paint and varnish manufacturer at Philadelphia, celebrated the diamond anniversary of the company on Oct. 28.

The regular November meeting of the Paint, Oil & Varnish Club of New York will be held at the Hotel Biltmore on Thursday evening, November 13. Dr. Maximillian Toch, who recently returned from a 7-month trip which practically took him around the world but which kept him for a goodly part of the time in the Orient, will talk of his trip. Doctor Toch's talk will be profusely illustrated with pictures taken by himself and will be given under the title of "The Scientific Awakening of China." Henry G. Sidford, chairman of the delegates from the New York Club to the Atlantic City convention, will report in detail on convention activities.

Pierce & Stevens, Inc., chemical manufacturers and distributors, Buffalo, N. Y., in celebrating their fortieth anniversary, announce the completion of their new two story warehouse, plant, offices and railroad siding at 710 Ohio Street, modernly equipped in every respect.

New York Chemists Listen to Kendall and Zons

Prof. James Kendall's interesting reminiscences of his association with Arrhenius were the outstanding feature of the meeting on Nov. 6 of the New York section of the American Institute of Chemists. A talk of civic, as well as industrial, interest was given by Kenneth Allen, sanitary engineer, who told of New York's problem of sewage disposal and the pollution of New York harbor by industrial wastes. F. W. Zons discussed the application of chemistry to radio, a subject particularly timely since the dinner at Stewart's restaurant had been preceded by an inspection of the W E A F station of the American Telephone & Telegraph Co.

Larger Output of Sodas Reported for 1923

The Department of Commerce announces that, according to the data collected at the biennial census of manufacturers, 1923, sodas and sodium compounds to the value of $114,374,028 were manufactured during the year, an increase of 36.7 per cent as compared with $83,698,199 in 1921.

The leading commodities of this group are soda ash, with a production for sale of 1,258,780 tons, valued at $32,427,166; sodium hydroxide or caustic soda, 430,961 tons (of which 119,123 tons was electrolytic), valued at $25,056,547; and sodium silicate, 675,674 tons, valued at $10,468,358.

The statistics for 1923 and 1921 are summarized in the statement below. The figures for 1923 are preliminary and subject to such correction as may be found necessary upon further examination of the returns:

	Year	Number of Establishments	Production Quantity Tons	Made and Consumed Quantity Tons
Inorganic sodium compounds				
Biborate (borax)	1923	6	53,092	.....
	1921	6	20,113	1,614
Biehromate and chromate	1923	5	26,879	.....
	1921	9	18,169	.....
Carbonates:				
Soda ash	1923	14	1,707,987	449,207
Ammonia soda process	....	6	1,674,234	449,207
Other, including natural and electrolytic	....	8	33,753	.....
Soda ash	1921	19	959,593	183,265
Ammonia soda process	....	8	929,448	183,265
Other	....	11	30,145	.....
Sal soda (crystals)	1923	17	68,137	499
	1921	31	69,342	.....
Bicarbonate	1923	7	188,717	43,401
	1921	6	129,331	28,605
Chloride, refined	1923	11	477,506	387,411
	1921	8	67,750	26,592
Hydroxide (caustic):				
Ammonia soda process	1923	6	314,195	2,357
	1921	7	163,044	138
Electrolytic process	1923	17	122,424	3,301
	1921	18	75,547	7,557
Repacked caustic	1923	12	32,828	.....
	1921	10	33,228	.....
Hypochlorite	1923	8	10,939	.....
	1921	6	4,025	.....
			Pounds	Pounds
Iodide	1923	6	44,945	.....
	1921	7	26,138	.....
			Tons	Tons
Phosphate	1923	12	36,770	221
	1921	13	26,235	21
Silicate	1923	36	696,238	20,564
	1921	21	276,075	59,206
Sulphates:				
Niter cake	1923	41	119,981	24,640
	1921	38	55,578	6,613
Salt cake	1923	33	181,661	46,047
	1921	30	131,701	35,706
Glaubers salt	1923	21	72,132	5,940
	1921	21	60,162	8,121
Refined, anhydrous	1923	6	3,184	1
	1921	4	2,042	23
Thiosulphate (hypo)	1923	8	22,239	.....
	1921	10	17,826	.....
Sulphide	1923	15	35,156	4,461
	1921	14	24,682	2,000
Sulphite	1923	13	25,020	3,514
	1921	20	19,729	3,009
Other inorganic	1923	..	.....	.....
	1921	..	.....	.....
Organic sodium compounds				
			Pounds	Pounds
Acetate	1923	8	2,471,639	1,566,000
	1921	6	312,323	.....
Citrate	1923	6	417,982	.....
	1921	7	112,659	.....
Other organic	1923	..	.....	.....
	1921	..	.....	.....

Summary of soda-ash production, translated as 58% soda ash:

	Year	Production, Tons	Made and Consumed, Tons	For Sale, Tons
Total	1923	[1]2,272,207	479,716	1,792,491
	1921	1,257,234	201,498	1,055,736
	1919	1,916,586	508,100	1,408,486
Soda ash	1923	1,707,987	449,207	1,258,780
	1921	959,593	183,265	776,328
	1919	1,507,424	473,944	1,033,480
Bicarbonate (factor 0.631)	1923	188,717	43,401	145,316
	1921	129,331	28,605	100,726
	1919	190,894	49,338	141,556
Caustic (not electrolytic; factor 1.325, with adjustments for strength)	1923	314,195	2,357	311,838
	1921	163,044	138	162,906
	1919	217,893	2,282	215,611

[1] Includes soda products (modified, sesquicarbonate, and caustic ash) carried above under "other inorganic", but not represented below.

Financial

The National Distillers Products Corporation for quarter ended September 30 reports earnings of $370,768 and interest of $70,956, leaving net of $299,812 before depreciation, federal taxes and amortization of brands.

Report of Lee Rubber & Tire Co. and subsidiaries for quarter ended September 30 shows net sales of $3,499,296 and net loss of $22,022, after interest and depreciation, compared with net loss of $39,347 in preceding quarter.

F. O. Wetmore, chairman of the bankers committee of Wilson & Co., says that reorganization plan is not yet in shape to be announced and that it will probably be some time before it is entirely completed.

Personal

CRAIG A. BLAIR, formerly vice-president and chief chemist of the Yocum Laboratories, Irvington, N. J., has opened the Blair Laboratory, leather trade chemists, at 279½ Mulberry St., Newark, N. J.

GEORGE DUBPERNELL, who has been employed as a research chemist on methods of analysis at the Michigan Smelting & Refining Co., Detroit, Mich., since his graduation last June from the University of Michigan, is now with the Apollo Metal Works, LaSalle, Ill., as a research chemist in connection with its electroplating processes.

HAROLD EDMONDSON, an experienced sanitation engineer, has joined the staff of the mechanical engineering department of the Dorr Co., New York. Mr. Edmondson received his engineering training in England, and has had considerable construction and operating experience in Canada.

LEWIS C. KARRICK, consulting engineer for the Bureau of Mines and prominently associated in the work of that organization in oil shale at its Boulder, Colo., and Salt Lake stations, has been transferred to Pittsburgh. His work will be confined to low-temperature carbonization of Utah and Pittsburgh coals for the production of smokeless fuel and the disposal of byproducts.

Prof. E. C. KENDALL, who is in charge of the chemical division of the Mayo Foundation, University of Minnesota, has been appointed Chandler lecturer and will receive the Chandler Medal at a meeting to be held next February.

Dr. A. T. LARSON and Dr. R. L. DODGE have left the Fixed Nitrogen Research Laboratory to take up work with the du Pont company. Dr. Larson will be remembered for his papers on synthetic ammonia and he will undertake a similar line of work in his new connection.

Dr. S. C. LIND, chief chemist of the Bureau of Mines, delivered an address Oct. 31 on helium, which was broadcast by station W C A P at Washington.

Prof. RALPH H. MCKEE, of the department of chemical engineering, Columbia University, left Nov. 1 for Italy, Poland and France, partly on business and partly for a vacation. He will return the latter part of December.

Prof. C. W. PARMELEE, of the ceramic engineering department, University of Illinois, has recently returned from a visit to the plants engaged in the manufacture of electrical porcelain situated in Pennsylvania, New York, Maryland, West Virginia and Ohio. This visit was made in connection with research on the manufacture of electrical porcelain for high voltage lines.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Smithsonian Institution, Washington, D. C., Dec. 29 to Jan. 3.

AMERICAN ASSOCIATION TEXTILE CHEMISTS AND COLORISTS, Bellevue-Stratford, Philadelphia, Dec. 6.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Hotel Shenley, Pittsburgh, Pa., Dec. 3 to 6.

AMERICAN PETROLEUM INSTITUTE, annual meeting, Fort Worth, Tex., Dec. 9, 10 and 11.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, New York, Dec. 1 to 3.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-eighth annual meeting, Atlantic City, N. J., June 22 to 26, 1925.

FOREST PRODUCTS UTILIZATION CONFERENCE, National Museum, Washington, Nov. 19 to 20.

NATIONAL CONFERENCE ON UTILIZATION OF FOREST PRODUCTS, Washington, D. C., Nov. 19 and 20.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 1 to 4.

SOUTHERN EXPOSITION, Grand Central Palace, New York, Jan. 19 to 31, 1925.

Dr. Brooks Heads Committee on Chemistry of Petroleum

In an effort to contribute something toward overcoming the deficiencies in the knowledge of the chemistry of hydrocarbons, the National Research Council is setting up a committee on the chemistry of petroleum. Dr. Benjamin T. Brooks is to be its chairman, but the personnel of the committee has not been decided upon.

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Dr. Marie Farnsworth

Dr. Marie Farnsworth has the distinction of being the only woman member of the technical staff of the Bureau of Mines. She is employed as a chemist at the bureau's nonmetals experiment station at New Brunswick, N. J. Miss Farnsworth is engaged on research work dealing largely with gypsum and anhydrite. She comes from Holden, Mo., but took her doctor's degree and received most of her education at the University of Chicago, where she was graduated in 1918.

Obituary

CHARLES FERGIE, ex-president of the Canadian Mining Institute, who was well known throughout Canada and the United States, died recently in a Montreal hospital after an illness extending over several months. He was in his sixty-seventh year.

Oil Men Speak at Kansas City Meeting of A.C.S.

The October meeting of the Kansas City section of American Chemical Society was held on Oct. 24 at the University Club in that city. G. H. Clay, formerly with the Texas Co., gave a talk on "The Scientific Blending of Lubricating Oils for Viscosity." Following this F. W. Bruckmiller, of the Standard Oil Co., spoke on "Good Paraffin." The oil men of Kansas City were invited to attend this meeting and this, together with a good representation from Kansas University, brought out a large attendance.

Research Society to Hear Noted Speakers

New York alumni of Sigma Xi, a society for the promotion of research, have arranged a dinner for the evening of Nov. 17 at the Fraternity Club, 245 Madison Ave., where a number of nationally prominent speakers will discuss "The New Battle Front of Civilization." The principal address will be by Dr. Vernon Kellogg of the National Research Council and supplementary remarks on the same topic will be made by Dr. E. L. Thorndike, professor of psychology at Columbia; Dr. Edwin E. Slosson, director of Science Service; F. B. Jewett, vice-president in charge of research of the Western Electric Co.; Dr. Francis Carter Wood, director of cancer research, Crocker Laboratory, and Dr. Michael Pupin, professor of electromechanics at Columbia University.

The honorary committee in charge of arrangements includes, among others, Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers Association; Prof. Bradley Stoughton, of Lehigh University, and Dr. Milton C. Whitaker, president of the U. S. Industrial Chemical Co. Reservations can be made through W. H. Eddy of Teachers College, Columbia University.

Moroccan Phosphate Reported Sold at Less Than Cost

Government officials in charge of the Moroccan phosphate office are declining to give out any figures as to production and transportation costs in connection with the very active operation which now characterizes the production of phosphate in Morocco. It is stated that it is expected eventually to pay all of the expenses of the protectorate from the profits of the government's phosphate monopoly. At the present time, however, it is believed that phosphate is being sold at less than cost with the idea of establishing markets.

Market Conditions

Tin Salts Again Advanced in Price for November Delivery

Strong Position of the Metal Responsible for Uplift in Prices—Demand for Chemicals Improves

AS HAD been expected, the higher average price for tin last month resulted in an advance in quotations for tin salts for November delivery. The advance extended to tin oxide, bichloride of tin, tin crystals, and anhydrous tetrachloride of tin. Other metal salts also were in a firm position following recent gains in the general metal market and increased call for some of these salts undoubtedly would have a strengthening effect on the market.

Arsenic, which has been very quiet for some time, has been meeting with a better inquiry. Actual trading has not opened up to any extent but consumers are testing the market. Some uncertainty exists regarding the amount of stocks on hand and the probable effect of these supplies on future trading. Some reports say there are large amounts of arsenic held over from last season and that buying will also be affected adversely because of the large carryover of calcium arsenate.

The weighted index number for the week was 154.49 which compares with 154.79 for the preceding week. The decline was brought about by reductions in crude cottonseed oil as chemicals were practically unchanged during the interval. The steady tone to chemicals is further emphasized that contract prices for several selections are to be held on the same basis as ruled for 1924 deliveries. It is also noted that imported chemicals, including nitrite of soda, caustic potash, and permanganate of potash are firm with a tendency to advance.

Interest in imported nitrite of soda again has centered on the tariff status because of the permission granted to importers to intervene in the case. These importers, who are not directly interested in the case as originally brought, are expected to force the issue from the standpoint of the constitutionality of the flexible provisions of the tariff and thus involve other imported chemicals on which changes in duty have been made as well as those on which investigations have been made with final tariff decisions pending.

Acids

Sellers of citric and tartaric acids have been finding a narrow outlet with demand confined to moderate lots for prompt delivery. Large consumers, however, have shown more interest and are said to be interested in values for shipment in the early part of the year. The low levels which have been reached recently make it uncertain whether they will represent contract prices and this is made more uncertain because importers are quoting only for nearby shipment from abroad. Formic acid has failed to improve its position and buyers are obtaining concessions. Lactic acid is moving fairly well at former price levels. Acetic acid also holds a steady position with different industries taking on supplies. Gallic acid also is in fair demand, especially the technical grade. Oxalic acid is held down in price through competitive selling but there are rumors to the effect that selling pressure is diminishing. Sulphuric acid has continued to meet with heavy withdrawals on contract and new business is proving satisfactory. Census figures for the first 6 months of the year, just made public, show that production of sulphuric acid by fertilizer manufacturers in that period formed but 90 per cent of the acid consumed in these producing plants and there was a material decrease in the stocks on hand at the end of June as compared with those for January 1.

Imported Caustic Potash Steady—Tin Oxide Higher—Higher Prices Also Quoted for November Deliveries of Tin Crystals and Bichloride of Tin—Nickel Salts Offered on Contract — Denatured Alcohol Strong — Nitrate of Soda Easier—Permanganate of Potash in Limited Supply—Prussiates Quiet—Large Movement of Acetate of Lime

Potashes

Bichromate of Potash—The market was dull in the early part of the week with more activity in the latter part of the period. Buyers have been taking on supplies for prompt shipment and a fair total is said to have been booked in recent weeks for next year delivery. Prices are unchanged at 8½@8¾c. per lb. depending on seller and quantity.

Carbonate of Potash — Imports of carbonate in September are officially given as 749,722 lb. as compared with 1,766,924 lb. in September, last year. The market has continued along quiet lines and reports that foreign markets would advance in price have not yet been borne out. Spot holdings are fairly large and holders offer hydrated 80-85 per cent at 5c. per lb. and calcined 80-85 per cent at 5½c. per lb.

Caustic Potash — Consuming industries are well covered ahead and trading in the spot market has been slow. The recent advance in price has been well maintained and sellers are practically a unit in quoting 7¼c. per lb. for spot material. Shipments from foreign markets are held at 7¼c. per lb. The firmer position of imported caustic has increased demand for the domestic product and the latter in large lots is offered at 7¼c. per lb. at works.

Permanganate of Potash — Inquiry for spot material has run to relatively small lots and 13c. per lb. has been given as an inside price. A good call is reported for domestic offerings with the price varying according to quantity. On moderate sized lots 12¾c. per lb. is asked.

Prussiate of Potash—Inquiry for yellow prussiate has brought out prices of 16¾c. per lb. on spot and sellers who had been quoting 16½c. per lb. seemed unwilling to shade the 16¾c. price. Holdings are light and this is given as a steadying factor. Shipments from foreign points are quoted at 16½c. per lb.

Sodas

Bichromate of Soda—The market gained in activity in the latter part of the week with call for both large and small lots. Export inquiry also is reported. There has been no departure from recent price levels but there is a difference in price according to seller. The lowest price heard is 6½c. per lb. and quotations range up to 6¾c. per lb.

Chlorate of Soda—Holders of chlorate of soda report a fair call for spot material with sales at 6½c. per lb. For shipment from abroad there are sellers at 6c. per lb. Domestic chlorate is offered at 6½c. per lb. at works.

Caustic Soda—Export inquiry is said to have been good. The prices asked for export show a range from 2.85c. to 3c. per lb. Some sellers who were offering at 2.85c. per lb. in the previous week were holding out for 2.90c. per lb. and some reports credited the market as being firmer. There was no change in the situation as referred to the domestic trade but a good contracting business is expected before the end of the year.

Fluoride of Soda — Arrivals from abroad were reported last week and the spot supply was increased. Demand is reported as moderate but prices are on a steady basis and 8½c. per lb. is an inside price with sellers.

Nitrite of Soda—Buyers have been interested in spot nitrite and with holdings light, the market has remained in a firm position. Asking prices are 9¼@9½c. per lb. Domestic producers are finding a good call for deliveries against standing orders and have but little surplus stocks for new orders. The market was of interest also because of the report that importers were to file a brief in order to test the legality of the tariff law under which the advance in duty was made.

Nitrate of Soda—Prices for nitrate have been irregular. Stocks have gained in volume and with buying quiet, sellers have been competing for business. The general asking price for spot nitrate is $2.40 per 100 lb. but buyers were able to do better and reports were heard to the effect that sales had gone through at $2.37½ per 100 lb. Later deliveries were less subject to price cutting and December was held at $2.40 per 100 lb.

Miscellaneous Chemicals

Acetate of Lime — Production of acetate of lime in August is announced as 8,112,277 lb. Shipments were larger than in the preceding month and reached a total of 10,515,940 lb. which was the largest for any month since April. Stocks at the end of August were 19,335,305 lb. Present demand is reported to be good both for home and for export. The price is steady at $3 per 100 lb.

Arsenic—Producers of domestic arsenic report a better demand with offerings at 6¾c. per lb. delivered. Mexican arsenic was offered last week at 6½c. per lb. Prices for imported arsenic vary, with Japanese quoted at 6¼c. per lb. on spot and European at 6½c. per lb. Japanese arsenic for shipment has sold at 6c. per lb. and the latter figure is still in effect. General interest in arsenic is gaining but buyers are influenced by reports that large surplus stocks are being carried in this country and that holdings of calcium arsenate also are large.

Bleaching Powder—A steady call is reported for liquid chlorine and inquiry for additional lots has been of larger volume. Asking prices are on a steady basis with tank shipments at 4½c. per lb. at works and carlots, in cylinders at 5½c. per lb. at works. Bleaching powder also is moving well on contract and a good contract demand expected in the near future. Quotations are unchanged at $1.90 per 100 lb. for large drums, carlots, at works. Exports of bleaching powder from the United Kingdom for the first 9 months of the year were 22,313,536 lb. as compared with 20,835,696 lb. in the corresponding period of 1923.

Formaldehyde — Sellers report the market as strong but there has been no change in quotations and 9c. per lb. is still quoted for carlots. Less than carlots are held at 9½c. per lb. and upward. Demand is fair with some sellers reporting a large volume of sales in the past 3 weeks.

Sal Ammoniac—There was no change in the market during the week. If anything imported offerings were a little less active but prices were held at 6c. per lb. for white on spot and at 5¾c. per lb. for shipment. Domestic white was maintained at 7c. per lb. at works.

Tin Salts—Schedules for November delivery of tin salts are higher under the influence of the metal market. Sellers announced an advance of 2c. per lb. for tin oxide, making the asking price 56c. per lb. Tin crystals were marked up to 37½c. per lb., bichloride of tin to 15c. per lb., and anhydrous tetrachloride of tin to 29½c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	154.49
Last week	154.79
Nov., 1923	166.00
Nov., 1922	159.00
Nov., 1921	147.00
Nov., 1920	240.00
Nov., 1919	239.00
Nov., 1918	279.00

Weakness in crude cottonseed oil offset higher prices for linseed oil and metal salts, resulting in a decline of 30 points in the weighted index number.

Alcohol

While the market for denatured alcohol was in a firm position producers announced no changes in the selling schedule. Demand was good and stocks for this season of the year remain comparatively small. Formula No. 1, special denatured, was quoted at 55c. per gal., in drums, carload lots.

Methanol is gradually working into a more favorable position from the producers' standpoint. Production has been restricted in most quarters. The output in August was placed at 444,612 gal., which compares with 404,132 gal. in July and 654,822 gal. in August, 1923. Prices did not change, the 97 per cent grade holding at 76c. per gal., and the 95 per cent grade at 74c. per gal., in bbl., carload lots. There was no change in butanol, production remaining at capacity, with prices steady.

Coal-Tar Products

Production of Byproduct Coke Shows Little Change—Benzene Firm —Naphthalene on Spot Unsettled; Futures Steady

REPORTS from byproduct coke plants indicate that no important change has taken place in production. The market for coke is marking time pending developments in the iron and steel industries. As a result of this condition at producing centers offerings of crudes remain light, and prices steady to firm. Higher prices are expected for gasoline and an advance in the petroleum product would benefit sellers of benzene. Trading in refined naphthalene again was disappointing. Efforts to interest buyers of refined naphthalene in 1925 contracts met with little success, due chiefly to the fact that spot and nearby material was available at concessions. Phenol held firm on fairly large withdrawals against old contracts. Cresylic acid was offered freely and prices were unsettled, varying according to seller. Inquiry was in evidence for aniline oil, ortho-toluidine and beta-naphthol. First hands announced a decline in the price of para-nitrotoluene. Pyridine supplies on spot were scanty and, with steady prices abroad, the market ruled firm in all quarters.

Benzene—Producers look for no important developments in benzene this side of January. Supplies are moderate and not likely to increase until the call for iron and steel improves and brings with it a greater demand for byproduct coke. Producers repeated prices on the tank car basis of 23c. per gal. for the 90 per cent and 25c. per gal. for the pure, f.o.b. works.

Creosote — Exports of creosote and tar oil from the United Kingdom for the 9 months ended Sept. 30 amounted to 31,771,003 gal., which compares with 35,441,282 gal. in the corresponding period a year ago. English and European markets for creosote oil have steadied lately on improved buying for export. Manchester quotes 5¾d. per gal., loose, works.

Cresylic Acid—There were offerings of 60 per cent acid for prompt shipment from English ports at 1s. 8d. per gal., indicating that the market abroad has developed further weakness. Demand here was moderate and prices irregular on rather liberal offerings. Quotations on the 97 per cent grade ranged from 62@65c. per gal., as to seller.

Ortho-toluidine — The market was steady on a fairly good inquiry from consumers. Producers maintained prices at 14@15c. per lb., in bbl., prompt shipment from works.

Naphthalene—White flake on spot was offered down to 4½c. per lb., with the demand slow. One producer offered flakes at 5½c. per lb., whole of 1925 delivery, but consumers could not be interested in futures at this time. The wide spread between spot and futures tends to restrict contract business. Figures just released show that the United Kingdom exported 38,824 hundredweight of naphthalene in the 9 months ended Sept. 30, which compares with 149,620 hundredweight in the corresponding period a year ago.

Para-nitrotoluene—Offerings have increased and one producer now quotes the market at 40@41c. per lb., a decline of 2c.

Phenol—New business was not active, but withdrawals of phenol against contract were sufficient to hold down stocks and steady the market. Scattered sales took place on the basis of 24c. per lb., large drums, and 25c. per lb., small drums. Producers quoted 24c. on contract.

Vegetable Oils and Fats

Crude Cottonseed Oil Offerings Increase—Linseed Oil Advances—Corn Oil Lower—Nearby Coconut Oil Firm

OFFERINGS of crude cottonseed oil were larger and this weakened prices for the refined product in the New York market. Crude corn oil was slightly lower in the Middle West. Coconut oil sold at an advance in price, with offerings of nearby material comparatively small. Unfavorable crop news from the Argentine resulted in higher flaxseed prices here and the market for linseed oil advanced sharply. China wood oil met with a better call from varnish makers. Inquiry for tallow was reported late in the week and this steadied prices. Palm oil offerings were scanty and prices firm.

Cottonseed Oil—Hedge pressure in refined oil options was more in evidence, following weakness in crude oil, and prices eased off. Weakness in pure lard in Chicago also was a bearish development. Cotton crop news in the main was good and it now appears more than likely that close to 3,000,000 bbl. of refined oil will be available for the 1924-25 season. With this large supply of oil in sight refiners believe that prices will have to come down to a point where soap makers and exporters can enter the market and absorb a good part of the surplus. Those who favor the long side of the market point to the smaller holdings of hogs and the firm position of the different hog products, chiefly lard. Crude cottonseed oil sold at 8¼c. per lb., tank cars, f.o.b. mills, Southeast, and at 8¼c. per lb., tank cars, f.o.b. mills, Texas points, a decline of ¼c. per lb. for the week. Compound makers were the principal buyers of crude. Seed was offered in volume at a decline of $2 per ton. Prime summer yellow oil on the Produce Exchange settled on Thursday with the November option at 10.38@10.40c. per lb., the January option at 10.23@10.24c. per lb. and the May option at 10.51@10.52c. per lb. A good part of the selling pressure was applied to the May option. Lard compound was easier, in sympathy with crude oil, and leading makers now quote 12⅞@13¼c. per lb., carload basis. Cash trade in refined oil and lard compound was fair. Pure lard in Chicago closed with cash at 14.75c. per lb., and January at 13.72c. per lb.

Linseed Oil—An advance of 6c. per gal. took place in the market for linseed oil, reflecting sharply higher prices for seed at Duluth. Some good trading occurred before the advance became general. After the rise, however, buyers showed little interest. The strength in seed was not unexpected, for news from the Argentine has been unfavorable for some time now and estimates of a private nature forecast a crop one-half the size of that raised a year ago. With a small crop in the Argentine crushers were anxious to accumulate supplies of domestic seed. The fact that navigation on the lakes will close soon also inspired buying of domestic seed for shipment to Buffalo and seaboard mills. Stocks of seed at Minneapolis on Nov. 1 amounted to 211,692 bu., which compares with 500,456 bu. on the corresponding date a year ago. Duluth seed, on Thursday, closed at $2.56 per bu. for November and December, and $2.65 per bu. for the May option. Buenos Aires quoted November seed at $2.19 per bu. Linseed oil in the New York market for November delivery closed at $1.06 per gal., in bbl., carload basis, with December at $1.04@$1.05 and January-April at $1.03@$1.04.

China Wood Oil—There was a fair demand for China wood oil for prompt and nearby shipment and the market steadied. Sales took place at 13¼c. per lb., tank cars, January shipment from the Pacific coast. In New York spot material brought 15@15½c. per lb., cooperage basis.

U. K. Imports of Palm Kernels Increase in 1924

Expansion in production of palm kernel oil in the United Kingdom continues, latest official returns indicating that 222,589 tons of kernels arrived in the 9 months ended Sept. 30, which compares with 195,469 tons in the same period a year ago. Imports of oilseeds into the United Kingdom for the 9 months' period, with a comparison, follow:

	1924	1923
Castor, tons	20,955	10,448
Copra, tons	63,551	61,827
Cottonseed, tons	282,414	341,941
Linseed, tons	420,429	350,691
Rapeseed, tons	65,077	48,562
Sesame, tons	7,576	3,230
Soya beans, tons	84,768	111,562
Peanuts, tons	95,617	85,931
Palm kernels, tons	222,589	195,469
Other sorts, tons	*56,919	*36,214

* Including sunflower seed.

Corn Oil—Crude oil sold in Chicago at 9⅝c. per lb., a decline of ¼c. Offerings were not large and bids later at 9¼c. were turned down.

Coconut—The sale of a tank car of Ceylon type oil for December shipment from New York established the market at 10c. per lb. for that delivery. Prompt oil was nominal at 10¼c. asked, tank car basis. On the Pacific coast 9¾c. per lb., tank cars, was asked on nearby material, and 9¼c. on January forward.

Olive Oil Foots—Several lots of spot material sold at 9¼c. per lb. Some sellers raised their views to 9½c. per lb.

Palm Oils—Importers were reserved in making offerings as stocks abroad were small and in firm hands. Niger oil for nearby delivery settled at 8⅝@8¾c. per lb. Lagos for shipment from abroad was nominal at 9¼c. per lb.

Other Vegetable Oils—Palm kernel oil was offered at 10¼c. per lb., in casks, prompt shipment from England, but there were no buyers. Sesame oil, refined, was offered at 13¼c. per lb., early 1925 delivery. Refined rapeseed oil was higher, prompt and afloat material selling at 98c. per gal. Castor oil was strong, but quotably unchanged on the basis of 17c. per lb. on the No. 3 grade.

Fish Oils—Some North Carolina crude menhaden oil was offered at 55c. per gal., tank cars, f.o.b. point of shipment. Oriental sardine oil sold at 51c. per gal., "if made" basis, f.o.b. Pacific coast ports. Newfoundland tanked cod oil was firm at 63@66c. per gal.

Tallow, Etc.—Business went through on the basis of 9¼c. per lb. for city extra special tallow. The market was firm, melters in most instances being sold up through December. Yellow grease was steady at 8¼c. per lb. Oleo stearine held at 13c. asked.

Miscellaneous Materials

Antimony—There was a better demand for antimony and with stocks moderate prices again moved upward. Chinese brands settled at 12¼c. per lb. Cookson's "C" grade 14¼c. per lb. Chinese needle, lump, nominal at 8½@9c. per lb. Standard powdered needle, 200 mesh, 9@10c. per lb. White oxide, Chinese, 99 per cent, 12@12½c. per lb.

Barytes—Shipments are about normal for this time of the year and prices are steady. Crude offered at $8.50 per ton, f.o.b. Missouri mines. On the 90@98 per cent $9 per ton asked, f.o.b. Georgia mines. Ground, off color, $13 per ton, with the white at $17 per ton, f.o.b. Baltimore. Water ground and floated, bleached, $23 per ton, f.o.b. St. Louis.

Cobalt—Market for the metal steady at $2.50@$3 per lb. On contracts these prices could have been shaded. Cobalt oxide unchanged at $2.10@$2.25 per lb.

Chrome Ore—Indian nominal at $18.50@$19.50 per ton, with Rhodesian at $21.50 per ton and New Caledonian at $24 per ton, c.i.f. Atlantic ports.

Glycerine—Importations of crude larger, but this resulted in no weakness in the domestic product. Crude soap lye glycerine, basis 80 per cent, offered at 11¾c. per lb., loose, f.o.b. point of production in the Middle West. Dynamite sold recently at 17¾c. per lb., in drums, carload basis. Chemically pure in good demand and steady at 18¾@19c. per lb., in drums, the inside figure obtaining on carload lots, New York.

Lithopone—Competition for new contract business keen, but prices did not change, leading interests asking 6@6½c. per lb., in bags, carload lots. On round lots as low as 5¾c. has been named on 1925 business.

White Lead—The "official" price of pig lead held at the recent advance to 8.65c. per lb. Demand was less active, but the stocks are barely sufficient at this time. There were no price changes in pigments, corroders holding the selling schedule to the 10½c. per lb. basis established in the preceding week for standard dry white lead. Demand for lead pigments was good.

Zinc Oxide—There was a moderate advance in zinc, but this failed to influence sellers of oxide. The market for zinc oxide held nominally at 7¾c. per lb. on the American process, lead free. French process, red seal, was unchanged at 9⅝c. per lb.

Imports at the Port of New York

October 31 to November 6

ACETONE OIL—23 csk., Rotterdam, R. W. Greeff & Co.

ACIDS—Citric—100 bbl., Messina, Order; 60 csk., Palermo, Canadian National Railways. **Oxalic**—13 csk., Rotterdam, R. W. Greeff & Co. **Tartaric**—740 csk., Palermo, Order.

ALUM—67 bbl., Gothenburg, Order.

ALUMINUM HYDRATE—225 pkg., Rotterdam, Meteor Products Co.; 225 pkg., Rotterdam, R. W. Greeff & Co.

AMMONIUM CARBONATE—4 csk., Rotterdam, Kuttroff, Pickhardt & Co.

AMMONIUM CHLORIDE—60 csk. zinc, Antwerp, A. Klipstein & Co.

ANTIMONY SULPHIDE—15 csk., London, L. H. Butcher & Co.

ARSENIC — 47 bbl. white, Tampico, Amercian Smelting & Refining Co.; 275 bbl., Tampico, American Metal Co.

BARIUM CHLORIDE—70 csk., Rotterdam, T. Goldschmidt Corp.; 66 csk., Antwerp, R. W. Greeff & Co.

BARYTES—87 csk., Glasgow, Toch Bros.; 60 csk., London, Order.

BORATE—6,000 bg., Los Angeles, Order.

CALCIUM NITRATE—32 csk., Rotterdam, Kuttroff, Pickhardt & Co.

CALCIUM CITRATE—82 csk., Messina, Order.

CAMPHOR — 56 cs., Havre, Standard Bank of South Africa.

CHALK—350 bg., Bristol, H. J. Baker & Bro.; 1,050 bg., Havre, Order; 800 tons crude, London, Baring Bros. & Co.; 500 bg., Antwerp, L. H. Butcher Co.; 400 bg., Antwerp, Brown Bros. & Co.; 1,100,000 kilos, Dunkirk, Taintor Trading Co.; 500 tons, London, Taintor Trading Co.; 2,000 bg., Antwerp, Taintor Trading Co.; 125 csk., and 200 bg., Bristol, H. J. Baker & Bro.

CHEMICALS—46 csk., Antwerp, Mechanics & Metals National Bank; 25 csk., Rotterdam, Innis, Speiden & Co.; 79 csk., Bremen, Mechanics & Metals National Bank; 27 cs., Bremen, Roessler & Hasslacher Chem. Co.; 18 bg., Glasgow, De Mattia Chem. Co., Inc.; 274 bg., Glasgow, Brown Bros. & Co.; 250 bg., Rotterdam, P. Uhlich & Co.; 7 cs., Rotterdam, Eimer & Amend; 40 csk., Hamburg, L. Sonneborn Sons; 41 pkg., Hamburg, Eimer & Amend; 92 kegs, Antwerp, Roessler & Hasslacher Chem. Co.

CHINA CLAY—1,602 tons, Fowey, Atlantic National Bank of Boston; 532 tons, Fowey, J. W. Higman Co.; 165 tons, Fowey, Morey & Co.; 20 tons, Fowey, L. A. Salomon & Bro.; 532 tons, Bristol, Moore & Munger.

COLORS—49 csk., Southampton, American Exchange National Bank; 44 pkg. aniline, Havre, Sandoz Chemical Works; 2 csk. do., Havre, American Exchange National Bank; 32 csk., Havre, Geigy & Co.; 4 csk. ultramarine blue, Antwerp, J. Campbell & Co.; 100 csk. aniline, Rotterdam, Grasselli Dyestuff Corp.; 41 csk. earth, Bremen, Heller & Merz; 53 cs. bronze, Bremen, Baer Bros.; 6 cs. do., Bremen, L. Uhlfelder & Co.; 10 csk. aniline, Havre, American Exchange National Bank; 40 csk. ultramarine blue, Glasgow, A. Maharrie; 20 cs. dry, London, R. F. Downing & Co.; 112 pkg. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 32 pkg. do., Rotterdam, Grasselli Dyestuff Corp.

CUTCH—500 bg., Singapore, Order.

FERROCHROMIUM — 61 csk., Gothenburg, C. Hardy, Inc.

FULLERS EARTH—500 bg., Bristol, L. A. Salomon & Bro.

GAMBIER—416 cs., Singapore, Order.

GLYCERINE—10 cs. crude, Bordeaux, Order; 20 dr. crude, Belfast, Marx & Rawolle; 100 dr. crude, Rotterdam, Order; 10 dr. crude, Dunkirk, Order; 30 dr. crude, Antwerp, Order.

GRAPHITE — 63 bg., Havre, International Ores & Metals Selling Co.; 798 bg., Marseilles, Order.

GUMS — 953 bskt. copal, Macassar, Equitable Trust Co.; 252 bskt. do., Macassar, Kidder, Peabody & Co.; 128 pkg. do., Macassar, American Exchange National Bank; 390 pkg. do., Macassar, Order; 600 cs. damar, Batavia, Order; 50 cs. damar, Batavia, W. Schall & Co.; 64 cs. do., Singaport, Guaranty Trust Co.; 200 bg. copal, Antwerp, Equitable Trust Co.; 310 bg. copal, Singapore, Order; 100 cs. damar, Singapore, L. Littlejohn & Co.; 300 cs. damar and 100 cs. copal, Singapore, Baring Bros. & Co.; 70 bg. damar, Guaranty Trust Co.; 300 cs. damar, Batavia, Order; 100 cs. do., Batavia, Stein, Hall & Co.; 150 cs. damar, Batavia, W. Schall & Co.

INFUSORIAL EARTH—1,075 bg., Vancouver, Order.

IRON OXIDE—58 csk., Bristol, Order; 210 bg., Bristol, G. Z. Collins & Co.; 58 csk., Bristol, Order.

LITHOPONE — 80 csk., Rotterdam, Reichard-Coulston, Inc.; 105 csk., Antwerp, E. M. & F. Waldo.

MAGNESITE — 250 bg. and 106 csk., Rotterdam, Brown Bros. & Co.

MANGANESE CHLORIDE — 39 csk., Glasgow, Roessler & Hasslacher Chem. Co.

MANGROVE BARK — 500 bg. extract, Singapore, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ARSENIC. Paris, France. Purchase.—12,079.

CHEMICALS, HEAVY. Recife, Brazil. Purchase and agency.—12,046.

PAINTS. Sao Paulo, Brazil. Purchase.—12,065.

PAINTS AND VARNISHES. Bushire, Persia. Purchase.—12,044.

PAINTS, varnishes, and pitch. Bahia, Brazil. Agency.—12,065.

ROSIN. Sao Paulo, Brazil. Agency.—12,079.

ROSIN for paper factories. Paris, France. Purchase.—12,082.

SODA, CAUSTIC. Vienna, Austria. Purchase.—12,065.

SULPHATE OF AMMONIA and other chemical fertilizer. Taihoku, Japan. Purchase.—12,081.

TURPENTINE. Genoa, Italy. Agency.—12,080.

MYROBALANS — 2,135 pkt., Calcutta, Order.

NUX VOMICA—200 bg., Cochin, Order.

OCHER—298 csk., Marseilles, Reichard-Coulston, Inc.

OILS—Cod—100 csk., St. Johns, Bowring & Co.; 650 csk., St. Johns, National Oil Products Co.; 150 csk., St. Johns, R. Badcock & Co.; 70 csk., St. Johns, E. H. Laing; 370 csk., St. Johns, Swan & Finch Co.; 500 bbl., Barrow, J. D. Irvin & Co. **China Wood**—100 dr., Hong Kong, Standard Bank of South Africa. **Coconut**—641 tons (in bulk), Manila, Order. **Olive foots** (sulphur oil)—100 bbl., Messina, Leghorn Trading Co. **Palm**—23 bbl., Antwerp, Elbert & Co.; 34 bbl., Antwerp, Order; 50 csk., Burutu, Irving Bank-Col. Trust Co.; 336 csk., Abonnema, Irving Bank-Col. Trust Co. **Sperm**—100 bbl., Glasgow, Order.

PHOSPHATE—750 bg., Antwerp, Order.

PHOSPHORUS—200 cs. amorphus, Antwerp, W. E. Miller.

POTASSIUM SALTS—300 csk. chlorate, Antwerp, Byrnes & Co.; 250 bg. nitrate, Antwerp, Order; 50 dr. permanganate, Antwerp, Order; 20 csk. oxalate, Rotterdam, Roessler & Hasslacher Chemical Co.; 300 bg. muriate, 700 bg. manure salt and 13,834 bg. sulphate, Bremen, Potash Importing Corp. of America; 40 dr. permanganate, Hamburg, Seaboard National Bank; 5,535 bg. muriate and a quantity (in bulk), Antwerp, Societe Comm. des Potasses d'Alsace.

PYRIDINE—6 dr., Antwerp, United States Industrial Alcohol Co.

QUEBRACHO—4,035 bg., Buenos Aires, Industrial Trust Co.; 506 bg., Buenos Aires, Order; 1,991 bg. solid extract, Buenos Aires, National Bank of Commerce.

QUICKSILVER—23 flasks, Tampico, H. J. Mackie; 100 flasks, London, A. Pickering & Co.; 100 flasks, London, G. W. Sheldon & Co.; 100 flasks, London, Leghorn Trading Co.

SAL AMMONIAC—6 pkg., Havre, American Express Co.; 60 csk., Rotterdam, Kuttroff, Pickhardt & Co.; 56 csk., Rotterdam, J. W. Hampton & Co.; 58 bbl., Hamburg, Order.

SHELLAC—97 bg., London, Order; 297 cs., London, Order; 24 cs., Rotterdam, C. F. Gerlach; 61 bg., Hamburg, Irving Bank-Col. Trust Co.; 20 cs. garnet, Hamburg, Order.

SODIUM SALTS—216 bbl. silico fluoride, Copenhagen, Order; 200 bbl. chlorate, Antwerp, E. Suter & Co.; 102 bbl. bisulphite, Antwerp, Order; 152 csk. silico fluoride, Rotterdam, Winter, Wolf & Co.; 200 csk. fluoride, Rotterdam, Brown Bros. & Co.; 600 bg. silico fluoride, Rotterdam, Order; 167 csk. phosphate, Antwerp, Brown Bros. & Co.; 3,607 bg. nitrate, Antofagasta, W. R. Grace & Co.

STARCH—300 bg. Copenhagen, Equitable Trust Co.; 400 bg., Copenhagen, Farmers Loan & Trust Co.; 250 bg., Rotterdam, Order.

SUMAC — 210 bg. ground, Palermo, Guaranty Trust Co.; 100 bg. do., Palermo, Irving Bank-Col. Trust Co.; 350 bg. do., Palermo, R. Newmann & Co.; 350 bg. do., Palermo, J. S. Young & Co.; 770 bg. do. and 100 bbl. leaves, Palermo, Order.

TALC — 1,500 bg., Los Angeles, Cal., Order.

TALLOW—200 tcs., Seattle, Order; 100 bbl., Los Angeles, Order.

TAPIOCA SIFTINGS — 5,750 bg., Batavia, Stein, Hall & Co.

TARTAR — 1,277 bg., Buenos Aires, Royal Baking Powder Co.; 130 bg. and 200 csk., Marseilles, C. Pfizer & Co.; 505 bg., Marseilles, Royal Baking Powder Co.

WAXES—14 bg. crude beeswax, Havana, Order; 40 cs. beeswax, Havre, L. A. Salomon & Bro.

WHITING—1,000 bg., Antwerp, Stanley, Doggett, Inc.; 6,100 bg., Dunkirk, Taintor Trading Co.

ZINC CARBONATE—30 csk., Rotterdam, Hans Heinrichs Chem. Co.

ZINC CHLORIDE—42 csk., Rotterdam, T. Goldschmidt Corp.

French Chemical Industries in the Orient

A Franco-Belgian consortium is developing chemical and allied industries in the extreme Orient, notably in China. The technical organization is proceeding but slowly owing to political conditions in China, but the various difficulties of the operating companies are being gradually smoothed out. The Société Industrielle de Chimie d'Extreme Orient is operating in conjunction with the Société des Verreries d'Extreme Orient, the Société des Glaces de Saint Gobain (French) and the Société des Glaces Nationales Belges. A combined plant is to be built at Haiphong in French Indo-China, of which the first element in operation will be the mechanical production of window glass and bottles.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Industrial Chemicals

Acetone, drums, works	lb.	$0.16 –	$0.16½
Acetic anhydride, 85%, dr	lb.	.34 –	.36
Acid, acetic, 28%, bbl	100 lb.	3.12 –	3.37
Acetic, 56%, bbl	100 lb.	5.85 –	6.10
Acetic, 80%, bbl	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl	100 lb.	11.01 –	11.51
Boric, bbl	lb.	.09 –	.09½
Citric, kegs	lb.	.45½ –	.46½
Formic, 85%	lb.	.11 –	.11½
Gallic, tech	lb.	.45½ –	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl	lb.	.12½ –	.13
22% tech., light, bbl	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½ –	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl	lb.	.09½ –	.09½
Phosphoric, 50% carboys	lb.	.07 –	.08
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl	lb.	.65 –	.70
Tannic, tech., bbl	lb.	.45 –	.50
Tartaric, imp., powd., bbl	lb.	.26 –	.27
Tartaric, domestic, bbl	lb.	.29 –	.30
Tungstic, per lb	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks	lb.	.30 –	.....
Ethyl, 190 p'f. U.S.P., bbl	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl	gal.	.61 –	.....
No. 1, 190 proof, special, dr	gal.	.55 –	.....
No. 1, 188 proof, bbl	gal.	.65 –	.....
No. 1, 188 proof, dr	gal.	.58 –	.....
No. 5, 188 proof, bbl	gal.	.60 –	.....
No. 5, 188 proof, dr	gal.	.55 –	.....
Alum, ammonia, lump, bbl	lb.	.03½ –	.04
Potash, lump, bbl	lb.	.02½ –	.03½
Chrome, lump, potash, bbl	lb.	.05½ –	.06
Aluminum sulphate, com., bags	100 lb.	1.35 –	1.40
Iron free, bags	lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½ –	.06½
Ammonia, anhydrous, cyl	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½ –	.12½
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.50 –	3.75
Antimony oxide, white, bbl	lb.	.11½ –	.12
Arsenic, white, powd., bbl	lb.	.06½ –	.06½
Red, powd., kegs	lb.	.14½ –	.15
Barium carbonate, bbl	ton	55.00 –	56.00
Chloride, bbl	ton	70.00 –	72.00
Dioxide, 88%, drums	lb.	.17½ –	.18
Nitrate, casks		.07½ –	.07½
Blanc fixe, dry, bbl	lb.	.03½ –	.03½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	.....
Spot N. Y. drums	100 lb.	2.20 –	2.25
Borax, bbl	lb.	.05 –	.05¼
Bromine, cases	lb.	.42 –	.45
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05½
Chloride, fused, dr. wks	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl	lb.	.06½ –	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06½ –	.07
Chalk, precip.—domestic, light, bbl	lb.	.04½ –	.04½
Imported, light, bbl	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks	lb.	.04½ –	.....
Contract, tanks, wks	lb.	.04½ –	.....
Cylinders, 100 lb., wks	lb.	.05½ –	.07½
Cobalt, oxide, bbl	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks	ton	15.00 –	16.00
Copper carbonate, bbl	lb.	.17 –	.17½
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16 –	.16½
Sulphate, dom., bbl	100 lb.	4.40 –	4.65
Imp. bbl	100 lb.	4.37½ –	.....
Cream of tartar, bbl	lb.	.20½ –	.21
Epsom salt, dom., bbl	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd	lb.	.13 –	.14
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99%, dr	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl	lb.	.25 –	.....
Fusel oil, ref., drums	gal.	4.00 –	4.50
Crude, drums	gal.	2.90 –	3.00
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.85 –	.95
Glycerine, c. p., drums extra	lb.	.18½ –	.19
Crude 80%, loose	lb.	.11½ –	.12
Hexamethylene, drums	lb.	.66 –	.70
Lead:			
White basic carbonate, dry, casks	lb.	$0.10½ –	.....
White, basic sulphate, casks	lb.	.10 –	.....
White, in oil, kegs	lb.	.1240 –	.....
Red, dry, casks	lb.	.11½ –	.....
Red, in oil, kegs	lb.	.1362 –	.....
Acetate, white crys., bbl	lb.	.15 –	.....
Brown, broken, casks	lb.	.14 –	.....
Arsenate, white crys., bbl	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks	ton	10.50 –	12.50
Bbl., wks	ton	18.00 –	19.00
Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11½ –	.....
Lithopone, bags	lb.	.06 –	.06½
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, bbl	gal.	.74 –	.76
97%, bbl	gal.	.76 –	.79
Pure, tanks	gal.	.76 –	.....
drums	gal.	.78 –	.80
bbl	gal.	.83 –	.85
Methyl-acetone, t'ks	gal.	.70 –	.....
Nickel salt, double, bbl	lb.	.10 –	.....
Single, bbl	lb.	.10½ –	.....
Orange mineral, csk	lb.	.14½ –	.14½
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½ –	.40
Potassium bichromate, casks	lb.	.08½ –	.08¼
Bromide, gran., bbl	lb.	.40 –	.44
Carbonate, 80–85%, calcined, casks	lb.	.05 –	.06½
Chlorate, powd	lb.	.06½ –	.08½
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08½ –	.08½
Hydroxide (caustic potash) drums	lb.	.07½ –	.....
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl	lb.	.06 –	.07½
Permanganate, drums	lb.	.13 –	.13¼
Prussiate, red, casks	lb.	.37 –	.38
Prussiate, yellow, casks	lb.	.16½ –	.17
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06½
White, gran., bbl., domestic	lb.	.07½ –	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	17.00
Soda ash, light 58% flat, bulk, contract	100 lb.	1.25 –	.....
bags, contract	100 lb.	1.38 –	.....
Dense, bulk, contract, basis 58%	100 lb.	1.35 –	.....
bags, contract	100 lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr	100 lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y	100 lb.	2.90 –	3.05
Sodium acetate, works, bbl	lb.	.05 –	.05½
Bicarbonate, bulk	100 lb.	1.75 –	.....
Bichromate, casks	lb.	.06½ –	.06½
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl	lb.	.04½ –	.04½
Chlorate, kegs	lb.	.06½ –	.06½
Chloride	long ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl	lb.	.08½ –	.09
Hyposulphite, bbl	lb.	.02½ –	.02½
Nitrite, casks	lb.	.09½ –	.09½
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl	lb.	.03½ –	.03½
Prussiate, yel. bbl	lb.	.09 –	.09½
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums)	100 lb.	.75 –	1.16
Silicate (60°, drums)	100 lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02½ –	.03½
Sulphite, crys., bbl	lb.	.02 –	.02½
Strontium nitrate, powd., bbl	lb.	.09 –	.09½
Sulphur chloride, yel drums	lb.	.04½ –	.05
Crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Flour, bag	100 lb.	2.25 –	2.35
Dioxide, liquid, cyl	lb.	.08 –	.08½
Tin bichloride, bbl	lb.	.15 –	.15½
Oxide, bbl	lb.	.56 –	.....
Crystals, bbl	lb.	.37½ –	.37½
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07½ –	.....
5% lead sulphate bags	lb.	.06½ –	.....
French, red seal, bags	lb.	.09½ –	.....
French, green seal, bags	lb.	.10½ –	.....
French, white seal, bbl	lb.	.11½ –	.....
Sulphate, bbl	100 lb.	3.25 –	3.50

Coal-Tar Products

Alpha-naphthol, crude, bbl	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl	lb.	.75 –	.80
Alpha-naphthylamine, bbl	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl	lb.	.19 –	.21
Anthracene, 80%, drums	lb.	.70 –	.75
Anthraquinone, 25%, drums	lb.	.65 –	.70
Benzaldehyde U.S.P., tech., drums	lb.	.70 –	.72
Benzene, pure, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl	lb.	.78 –	.80
Benzyl chloride, ref. carboys	lb.	.35 –	.....
Benzyl chloride, tech., drums	lb.	.25 –	.....
Beta-naphthol, tech., bbl	lb.	.24 –	.25
Beta-naphthylamine, tech	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.62 –	.64
95-97%, drums, works	gal.	.58 –	.60
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl	lb.	.20 –	.21
Dinitrophenol, bbl	lb.	.35 –	.40
Dinitrotoluen, bbl	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl	lb.	.72 –	.75
Meta-phenylenediamine, bbl	lb.	.90 –	.95
Monochlorbenzene, drums	lb.	.08½ –	.10
Naphthalene, flake, bbl	lb.	.04½ –	.05
Naphthionate of soda, bbl	lb.	.60 –	.65
Naphthionic acid, crude, bbl	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½ –	.14
N-W acid, bbl	lb.	1.00 –	1.05
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.11
Ortho-toluidine, bbl	lb.	.14 –	.15
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl	lb.	.17 –	.20
Para-nitraniline, bbl	lb.	.68 –	.70
Para-nitrotoluene, bbl	lb.	.40 –	.42
Para-phenylendiamine, bbl	lb.	1.30 –	1.35
Para-toluidine, bbl	lb.	.75 –	.80
Phenol, U.S.P., dr	lb.	.24 –	.26
Picric acid, bbl	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.20 –	4.30
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl	lb.	.50 –	.55
Salicylic acid, tech., bbl	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl	lb.	.16 –	.18
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.38 –	.40
Xylene, com., tanks	gal.	.25 –	.27

Naval Stores

Rosin B-D, bbl	280 lb.	$7.60 –	$7.65
Rosin E-I, bbl	280 lb.	7.60 –	7.65
Rosin K-N, bbl	280 lb.	7.65 –	7.75
Rosin W.G.-W.W., bbl	280 lb.	8.40 –	8.50
Turpentine, spirits of, bbl	gal.	.86 –	.86½
Wood, steam dist., bbl	gal.	.80 –	.82
Wood, dest. dist., bbl	gal.	.65 –	.68
Pine tar pitch, bbl	200 lb.	5.50 –	.....
Tar, kiln burned, bbl	500 lb.	11.50 –	12.00
Rosin oil, first run, bbl	gal.	.45 –	.....
Pine tar oil, com'l	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½–	$0.05½
Grease, yellow, loose	lb.	.08½–	.08¾
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Lard compound, bbl.	lb.	.13¼–	.13½
Neatsfootoil, 20 deg. bbl.	gal.	1.35 –	.....
Oleo Stearine	lb.	.13 –	.13½
Oleo oil, No. 1, bbl.	lb.	.21½–	.22
Red oil, distilled, d.p. bbl.	lb.	.10½–	.10½
Tallow, extra, loose works	lb.	.09½–	.....
Tallow oil, acidless, bbl.	gal.	.86 –	.87

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.17 –	$0.17½
Castor oil, No. 1, bbl.	lb.	.17½–	.17¾
Chinawood oil, bbl.	lb.	.15 –	.15½
Coconut oil, Ceylon, bbl.	lb.	.11½–	.....
Ceylon, tanks, N. Y.	lb.	.10¾–	.....
Corn oil, crude, bbl.	lb.	.11 –	.11⅛
Crude, tanks, (f.o.b. mill)	lb.	.09⅛–	.09½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08⅛–	.08½
Summer yellow, bbl.	lb.	.10½–	.10¾
Linseed oil, raw, car lots, bbl.	gal.	1.06 –	.....
Raw, tank cars (dom.)	gal.	1.00 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.08 –	.....
Olive oil, denatured, bbl.	gal.	1.18 –	1.22
Sulphur, (foots) bbl.	lb.	.09¼–	.....
Palm, Lagos, casks	lb.	.09½–	.09⅝
Niger, casks	lb.	.08⅛–	.08¼
Palm kernel, bbl.	lb.	.10¾–	.....
Peanut oil, crude, tanks (mill)	lb.	.11½–	.....
Refined, bbl.	lb.	.16 –	.16½
Perilla, bbl.	lb.	.14 –	.14½
Rapeseed oil, refined, bbl.	gal.	.98 –	.99
Sesame, bbl.	lb.	.13¾–	.14
Soya bean (Manchurian), bbl	lb.	.12 –	.12½
Tank, f.o.b. Pacific Coast	lb.	.11 –	.11½

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.63 –	$0.66
Menhaden, light pressed, bbl.	gal.	.68 –	.70
White bleached, bbl.	gal.	.70 –	.71
Crude, tanks (f.o.b. factory)	gal.	.55 –	.....
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochineal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½–	.04¾
Rangoon, bales	lb.	.13½–	.14½
Dextrine, corn, bags	100 lb.	4.52 –	4.79
Gum, bags	100 lb.	4.82 –	5.09
Divi-divi, bags	ton	42.00 –	43.00
Fustic, sticks	ton	30.00 –	35.00
Chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	16¾–	.17
Logwood, sticks	ton	25.00 –	26.00
Chips, bags	lb.	.02½–	.03
Sumac, leaves, Sicily, bags	ton	150.00 –	160.00
Domestic, bags	ton	50.00 –	55.00
Starch, corn, bags	100 lb.	3.87 –	4.14

Extracts

Archil, conc., bbl.	lb.	$0.16 –	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½–	.02½
Divi-divi, 25% tannin, bbl.	lb.	.05 –	.05
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.11 –	.11
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½–	.04
Hypernic, liquid, 51°, bbl.	lb.	.12 –	.13
Logwood, crys., bbl.	lb.	.14 –	.15
Liq., 51°, bbl.	lb.	.07½–	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½–	.04¾
Sumac, dom., 51°, bbl.	lb.	.06¼–	.06¾

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.09 –	$0.11
spot, cases	lb.	.12 –	.16
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Prussian, bbl.	lb.	.36 –	.37
Ultramarine, bbl.	lb.	.07 –	.35
Browns, Sienna, Ital., bbl.	lb.	.05 –	.12
Sienna, Domestic, bbl.	lb.	.03 –	.03½
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens-Chrome, C.P.Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.10½–	.11½
Paris, bulk	lb.	.24 –	.26
Reds, Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	.95 –	1.00
Vermilion, English, bbl.	lb.	1.30 –	1.35
Yellow, Chrome, C.P. bbls	lb.	.17 –	.17½
Ocher, French, casks	lb.	.02 –	.03

Waxes

Beeswax, crude, Afr. bg.	lb.	$0.28 –	$0.28½
Refined, light, bags	lb.	.33 –	.34
Candellila, bags	lb.	.27 –	.27½
Carnauba, No. 1, bags	lb.	.35½–	.37½
No. 2, North Country, bags	lb.	.27 –	.28
No. 3, North Country, bags	lb.	.24 –	.25
Japan, cases	lb.	$0.16 –	$0.16½
Montan, crude, bags	lb.	.06 –	.06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06½–	.06¾
Crude, scale 124-126 m.p. bags	lb.	.05½–	.....
Ref., 118-120 m.p. bags	lb.	.05½–	.05¾
Ref., 123-125 m.p., bags	lb.	.05¾–	.06
Stearic acid, agle. pressed, bags	lb.	.11 –	.11½
Double pressed, bags	lb.	.11½–	.12

Fertilizers

Acid phosphate, 16%, wks.	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.70 –	2.75
Blood, dried, bulk	unit	3.85 –	3.95
Bone, raw, 3 and 50, ground.	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.75 –	.....
Nitrate of soda, bags	100 lb.	2.37½–	.....
Tankage, high grade, f.o.b. Chicago	unit	3.00 –	3.25
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.00 –	3.50
Tennessee, 75%	ton	6.50 –	6.75
Potassium muriate, 80%, bags	ton	34.55 –	.....
Sulphate, bags, 90%	ton	45.85 –	.....
Double manure salt, bgs.	ton	26.35 –	.....
Kainit, 14%, bgs	ton	10.25 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.34 –	0.34½
Upriver coarse	lb.	.24 –	
Plantation—First latex crepe	lb.	.34½–	.35
Ribbed smoked sheets	lb.	.34¼–	.34½

Gums

Copal, Congo, amber, bags	lb.	$0.08 –	$0.10
East Indian, bold, bags	lb.	.13 –	.14
Manila, amber, bags	lb.	.14 –	.16
Damar, Batavia, cases	lb.	.25 –	.25½
Singapore, No. 1, cases	lb.	.28 –	.28½
Singapore, No. 2, cases	lb.	.19 –	.19½
Kauri, No. 1, cases	lb.	.58 –	.64
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.06 –	.09

Shellac

Shellac, orange fine, bags	lb.	$0.67 –	$0.68
Orange superfine, bags	lb.	.69 –	.70
Bleached, bonedry	lb.	.72 –	.73
T. N., bags	lb.	.65 –	.66

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh. ton	$300.00–	$350.00
Shingle, f.o.b., Quebec	sh. ton	50.00 –	60.00
Cement, f.o.b., Quebec	sh. ton	15.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	17.00 –	17.50
Grd., off-color, f.o.b., Balt	net ton	13.00 –	14.00
Floated, f.o.b., St. Louis, bbl.	net ton	23.00 –	24.00
Crude f.o.b. mines, bulk	net ton	8.50 –	9.00
Casein, bbl., tech.	lb	.10¼–	.12½
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 –	8.00
Powd., f.o.b. Ga.	net ton	12.00 –	16.00
Crude, f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	10.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 –	7.25
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 gr'd. N.C.	long ton	15.32 –	21.00
No. 1 Canadian, f.o.b., mill, powd.	long ton	20.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½–	.06
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.12 –	.12½
Tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.20 –	.....
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, calcined	ton	32.00 –	35.00
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl.	lb.	.06 –	.08
Dom., ground, bbl.	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.25
Sand blast, f.o.b. Ind.	ton	2.25 –	3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Glass sand, f.o.b. Ill.	ton	2.00 –	2.50
Soapstone, coarse, f.o.b., Vt., bags	ton	7.50 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
200 mesh, f.o.b., Ga.	ton	9.50 –	10.00
325 mesh, f.o.b. New York, grade A	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	$2.85
Corning	bbl.	1.50 –	.....
Cabell	bbl.	1.45 –	.....
Somerset	bbl.	1.55 –	.....
Illinois	bbl.	1.37 –	.....
Indiana	bbl.	1.38 –	.....
Kansas and Okla. under 28 deg.	bbl.	.75 –	.85
California, 35 deg. and up	bbl.	1.40 –	.....

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	$0.15 –	.....
Naphtha, V. M. & P. deod, steel bbls	gal.	.14 –	.....
Kerosene, ref. tank wagon	gal.	.13 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.08½–	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	33 –	$0.36
Bloomless, 30@ 31 grav.	gal.	24 –	.....
Paraffin, pale 885 vis	gal.	15½–	.16½
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls.	lb.	.04½–	.04¾
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–	$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–	47
Chrome cement, 40-50% Cr_2O_3	ton	23–	77
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23	00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–	43
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	33–	37
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65–	68
9-in. arches, wedges and keys	ton	80–	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–	50
9-in. sizes, f.o.b., Birmingham.	1,000	48–	59
F.o.b. Mt. Union, Pa.	1,000	35–	38
Silicon carbide refract brick, 9-in.	1,000	1,180	00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, ton		$200.00 –	.....
Ferrochromium, per lb. of Cr, 1-2% C.	lb.	.30 –	.....
4-6% C	lb.	.12½–	.....
Ferromanganese, 78-82% Mn. Atlantic seabd. duty paid	gr. ton	100.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	33.00 –	35.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	2.00 –	2.25
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	72.00 –	75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.88 –	.90
Ferro-uranium, 35-50%, of U, per lb. of U.	lb.	4.50 –	.....
Ferrovanadium, 30-40%, per lb. of V.	lb.	3.25 –	3.75

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 –	.....
C.i.f. Atlantic seaboard	ton	18.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	4.00 –	4.50
Coke, furnace, f.o.b. ovens	ton	3.00 –	3.10
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50 –	18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½–	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.41 –	.45
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.70 –	.75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –	.....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	.....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.00 –	.....
Tungsten, wolframite, white, 60% WO_3	unit	8.75 –	9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pentoxide, 99%	lb.	12.50 –	14.00
Vanadium ore, per lb. V_2O_5.	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½–	$0.13¾
Aluminum, 98 to 99%	lb.	.27 –	.28
Antimony, wholesale, Chinese and Japanese	lb.	.12½–	
Nickel, 99%	lb.	.29 –	.30
Monel metal	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.53¾	
Lead, New York, spot	lb.	.0865	
Zinc, spot, New York	lb.	.06925	
Silver (commercial)	oz.	.69¾	
Cadmium	lb.	.55–	.60
Bismuth (508 lb. lots.)	lb.	1.85	1.90
Cobalt	lb.	2.50–	3.00
Magnesium, ingots, 99%	lb.	.90–	.95
Platinum, refined	oz.	118.00	
Mercury	75 lb.	69.00–	70.00
Tungsten powder	lb.	.95–	1.00

Industrial Developments of the Week

New Construction and Machinery Requirements in the Process Industries

Some Opportunities This Week

Cement paint.....Chattanooga, Tenn.
Cement plant.....Norfolk, Va.
Chemicals.....Modesto, Calif.
Clay products.....Alliance, Ohio.
Clay products.....Worthington, Pa.
Coke and gas.....Chattanooga, Tenn.
Cotton seed oil.....Roswell, N. M.
Electric furnace.....Milwaukee, Wis.
Fire brick.....Snow Shoe, Pa.
Gypsum.....Cleveland, Ohio
Laboratories.....Jackson, Fla.
Oxygen.....Labanon, Pa.
Powder plant.....Lacey, Wash.
Pulp mill.....LaTuque, Que.
Rubber.....Rock Island, Ill.
Varnish oils, paints, etc......Montreal, Que.
Waxed paper.....Los Angeles, Calif.

This page is of value not only as a machinery market but also as an index of the general activity and growth of the industries served by Chem. & Met. The reports are gathered by our regular correspondents who are instructed to verify every detail. Requirements for new machinery will be published here free of charge.

Middle Atlantic

Pa., Lebanon—The Air Reduction Sales Co., 342 Madison Ave., New York City, plans to establish a branch plant for the manufacture of industrial oxygen, and kindred products. The Industrial Committee of the Lebanon Chamber of Commerce is interested in the project.

Pa., Snow Shoe—The J. H. France Refractories Co., recently organized, has taken over the fire brick plant formerly owned by the Snow Shoe Fire Brick Co. Fire brick for furnace and steel mill use will be manufactured.

Pa., Worthington—The Graff-Kittanning Clay Products Co., plans the construction of a 3 story, 112 x 256 ft. factory, estimated cost $50,000, including equipment. L. B. Pierce is engineer.

South

Ala., Birmingham—Southern Arsenic & Mineral Products Co. of Birmingham and Atlanta, Ga., plans developing deposits of arsenious pyrites in Randolph County.

Ala., Greenville—Purity Fertilizer Co., W. J. Beeland, plans to rebuild plant which was destroyed by fire at a loss of $15,000.

Ala., Talladega—Talladega Fertilizer & Manufacturing Co.'s plant on West North St. was destroyed by fire, estimated loss $10,000.

Fla., Jacksonville—Bo-Kay Perfume Co., 732 Forest Ave., plans the construction of new laboratories.

Ga., Canton—The Summers Fertilizer Co., Stock Exchange Bldg., Baltimore, Md., has acquired the former plant of the Hubbard Fertilizer Co., Canton, and plans to make extensions and install additional equipment.

Tenn., Chattanooga—American Cement Paint Co. W. P. D. Moros, Pres., awarded the contract for the construction of a 50 x 170 ft. factory, to Dixie Concrete Products Co. Estimated cost $60,000.

Tenn., Chattanooga—Chattanooga Coke & Gas Co., James Bldg., A. C. Stephenson, Mgr., plans to expend $30,000 on improvements to its Alton Park plant, work under direction of Semet Solvay Co., Alton Park.

Va., Norfolk—Virginia Portland Cement Corp., subsidiary of the International Portland Cement Corp., 342 Madison Ave., New York City, will build a cement plant here, estimated to cost $1,500,000. Work will be done by separate contracts under the supervision of the company engineers.

Middle West

Ill., Rock Island—Servus Rubber Co., 401 Central Park Bldg., awarded the contract for the construction of a 3 story, 80 x 150 ft. rubber factory, to M. A. Floyd & Co., Andrus Bldg., Minneapolis, Minn.

Mich., Detroit—Kohner & Seeler, 1402 Kresgo Bldg., Archts., will receive bids until Nov. 25 for the construction of a 3 story and basement, 100 x 160 ft. factory for French dry cleaning equipment on Piquette Ave., for Jacoby Dry Cleaners, 10 Custer St. Equipment will be required.

O., Alliance—Alliance Clay Products Co., plans to vote on a proposition to increase their capital from $200,000 to $500,000 for the purpose of constructing a third unit to the plant. The company has acquired considerable acreage of shale deposits and will erect an additional plant near plant No. 2, estimated cost is $250,000. Special equipment will be purchased if plant is authorized.

O., Cleveland — The American Gypsum Co., Discount Bldg., awarded the contract for the construction of a 1 story, 52 x 132 ft. mill and factory at 1270 West 3rd St., to The Austin Co., 16112 Euclid Ave. Estimated cost $60,000.

Wis., Milwaukee—F. Wabiszewski, Kilbourn Rd., manufacturer of castings, is in the market for one electric furnace.

West of Mississippi

Mo., Kansas City—Stewart Sand Co., 615 American Bank Bldg., has awarded general contract for plant for manufacture of brick mortar, plaster and finishing putty, including mill building, warehouse, 2 sand storage tanks, to G. C. Swanson Bros. Co., Shubert Theater Bldg. Estimated cost $75,000.

Mont., Sidney — The Holly Sugar Co., Denver, Colo., plans the construction of a 1,000 ton capacity sugar manufacturing plant for the lower Yellowstone valley. Estimated cost $1,000,000.

N. M., Roswell—F. Kell & R. S. Allen, Wichita Falls, Tex., c/o C. C. Littleton, Roswell, Manager, plans the construction of a cotton seed oil mill. Estimated cost $100,000. Engineer not selected.

Tex., Big Lake—E. H. Shaufler, Gen. Mgr., Kansas City, Mexico and Orient R.R., is reported to be negotiating with Transcontinental Oil Co., Pittsburgh, Pa., and the White Eagle Oil and Refining Co., Federal Bank Bldg., Kansas City, Mo. for the erection of an oil refinery.

Far West

Calif., Berkeley—Marshall-Steel Co., 2124 Center St., is having plans prepared for the construction of a 1 story, 130 x 315 ft. cleaning and dyeing plant at Grove and Dwight Sts. Estimated cost $125,000. R. V. Woods, 505 17th St., Oakland, is engineer.

Calif., Los Angeles—The Western Waxed Paper Co., Oakland, Calif., plans the construction of a 120 x 150 ft. factory at East 61st St., estimated cost $40,000 exclusive of equipment.

Calif., Modesto—D. V. O. Products Co., c/o Chamber of Commerce, will build the 1st and 2nd units, 80 x 100 ft. and 92 x 140 ft. of a factory for the manufacture of chemicals and chemical compounds, molasses, syrups, etc. Estimated cost $200,000. Work will be done under supervision of C. E. Gilman, engineer.

Wash., Lacey—The Dumor Chemical Co., Pioneer Bldg., Seattle, has purchased a 160 acre site, and plans the construction of a powder plant on Hawkes Prairie near Lacey. A. H. Kohn is president and G. P. T. Mack is secretary.

Canada

Que., LaTuque—The Brown Corporation, Ltd., plans the construction of a pulp mill. Estimated cost $500,000.

Que., Montreal—Lustre Canadian Ltd., c/o J. E. Desjardins, 92 Notre Dame St., East, plans the construction of a plant for manufacturing of polish, varnish oils, paints and materials used in the manufacture thereof. Complete equipment will be required.

Incorporations

Queneida Graphite Co., Birmingham, Ala., J. F. B. Baugh, J. W. Cole, Arcadia Apts., and R. J. Emerson.

Warren Cotton Oil Co., Montgomery, Ala., $100,000; J. T. Stevens, E. T. Allen and others.

Royalty Oil Refining Co., Dover, Del., $500,000. (U. S. Corp. Co.)

Bass Chemical Engineering Co., Wilmington, Del., manufacture disinfectants, $500,000. (Corp. Trust Co. of America).

Capital Tire Co., Wilmington, Del., manufacture, $50,000. (Corp. Service Co.)

Chicago Foundation Medical Clinic, Inc., Wilmington, Del., manufacture of chemical and medicinal compounds, $500,000.

Headway Soap Works, Inc., Wilmington, Del., $100,000. (Delaware Registration Trust Co.)

Tripps Blood Remedy Co., Wilmington, Del., manufacture of medicinal and chemical products, $500,000.

Southern Paint Co., Inc., Monroe, La., $12,000; C. J. Raley, Pres., J. J. Turner, Secy. and Treas., 1015 De Siard St.

Hillyard Chemical Co., St. Joseph, Mo., $120,000; N. S. Hillyard, F. D. McKinley G. W. Groves, 425 North 25th St.

St. Louis Soap Co., St. Louis, Mo., P. Paull, 4321 Shaw St., L. R. Shirgis and others.

T. & G. Dye Works, Brooklyn, N. Y., $20,000; L. Tarushkin, H. Glick, M. Bernard (Attorney J. S. Gross, 160 Broadway, New York City).

Carolina Standard Gas Products Co., Charlotte, N. C., $100,000; J. C. McGowan, Pres. E. R. Bucher, Secy., 521 Sunnyside Ave.

Piedmont Rubber Co., High Point, N. C., $100,000; L. Butler, D. L. Lewis and others.

Pontotoc Petroleum & Refining Co., Muskogee, Okla., $50,000; F. E. Lee, 1159 Locust St., N. E. Maurer, J. F. Webster.

Heyward Fertilizer Co., 23 Broad St., Charleston, S. C., B. R. Heyward, G. E. Grimball.